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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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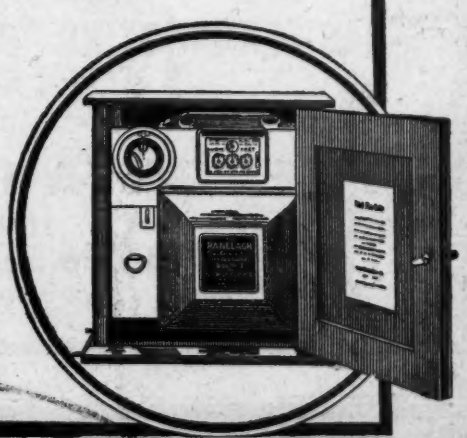

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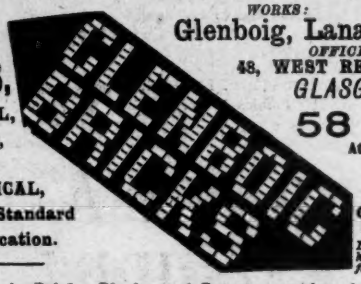

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VOL. CLXVI., No. 3178.] WEDNESDAY, APRIL 9, 1924. [76TH YEAR.

EDITORIAL NOTES.

Public Service.

THE District Conferences of the "B.C.G.A." are a feature of their programme of propaganda which must not be dispensed with. The programme of the Association, however, is not one of those creations of cast-iron form which can never be changed. Alterations can be, and are, effected as and when occasion demands; and this is frequently found to be desirable, seeing that action is not always guided by the claims of education and dissemination, but by the doings of others. The district conferences afford opportunities and platforms which produce a large amount of publicity in the newspapers circulating in the area; and therefore, as a fixed item in the programme, they are highly valuable. It was so with the one at York, as reported in our columns last week; and especially as it was happily associated with the centenary celebrations of the York Gas Company and of the inauguration of the Company's new vertical retort settings. These combined events gave a tone to the conference somewhat different from usual. This was found throughout the proceedings, and particularly in the opening address of the President of the conference (Mr. Alfred Procter, the Chairman of the York Gas Company), in the eloquent and philosophic paper by Mr. H. E. Bloor (the Engineer of the Company), and in the remarks of Mr. F. W. Goodenough, the Executive Chairman of the Association. The York directorate have always been hearty supporters of progressive and co-operative work in the industry. As a matter of fact, they cannot help it; for it is a traditional part of the Company's policy to scrutinize their own operations from the public point of view, and deliberately to adapt them to the utmost extent to serve the best interests of the public. By doing this, the maximum interests of the Company are also served.

Public service was the note of the conference; and this was an excellent thing. Scanning, as we are constantly doing, the conditions existing throughout the industry, we see considerable fields in which educational propaganda is wanted as much among gas undertakings as among the public. The latter require to be told of the numerous ways in which gas can serve them; but some gas administrations need to be educated up to the fact that something else is necessary. It is that consumers should be made to understand how to get the highest possible efficiency from their appliances; and as it is more or less an expert's job to maintain gas appliances in a fit condition to realize maximum efficiency, periodical house-to-house inspection and advice is work that should be undertaken by gas suppliers. The amount of neglect that there is in this regard proves that there are many managements—not officials only, but directorates and committees—who have not yet realized what public service means, and the genuine value there is in it not only for the present, but the future. We are afraid this is largely to be found in the districts of the smaller and some medium-sized concerns, but all large undertakings could not claim to be exempt from the charge of neglect. In fact, we hear of complaints from consumers in gas-supply areas varying greatly in respect of business done; and those complaints are mainly more or less traceable to incomplete combustion, which means that inefficiency and other things which breed discontent could be considerably obviated by simple burner adjustment. Supplementing this is, of course, the propensity of consumers for buying inefficient appliances because they are cheap. They know they are cheap; but they do not know they are inefficient. It really passes understanding that these things should be, when every gas man must know that such conditions are the strongest possible incentives to a transfer of custom, with competitors in the field who are straining every nerve to make their light, heat, and power methods more acceptable to, and more realizable in respect of terms by, the public.

There is general talk of the progress of the industry, and of the fair field lying ahead. This usually comes from men working under a policy which is productive of satisfaction, and therefore of stability. But there are others, and not a few, who do not know the true meaning and effects of public service. Unless this changes, we are fairly confident that in the course of a few years we shall have an ugly patchwork of an industry, with bright colours representing progress here and drab colours representing diminishing prosperity there. It is a noteworthy point that, in all gas-supply areas—York is an example—where house-to-house inspection, adjustment, and advice are practised, less complaint is heard, more satisfaction obtains, and the road of the competitor is made the more difficult. It is not competition only of which we should take account. The advance of gas utilization which is promoted by public service is in itself a service of great intrinsic worth to the public in several important respects. Gas has, as Mr. Bloor says, revolutionized urban, home, and industrial life; and the revolution will continue where gas men have learned and practise the ways of causing larger utilization. We cannot compel people to adopt gas; we can induce adoption by doing those things which will give satisfaction. Perhaps it is wise to have an ideal. The best ideal is all-gas houses. This is an ideal which will not be realized by neglect. There is a lesson for gas managements in the "almost" all-gas houses which those present at the York conference went out to see in the Joseph Rowntree village, and to which reference was made in the short paper by Mr. W. J. Swain, who there welcomed the visitors. To induce the Yorkshire women to give up their coal ranges was at first difficult; but when it was found that they had more leisure, less work, and better results, the word went round, and now coal ranges are taken out at the request of the tenants themselves. That is what we want to see not only in villages, but in all gas-supply areas. The question for gas men is, How is it to be achieved? The reply is by public service; and public service does not stop at the meter, but goes beyond, and ensures that the commodity over which so much trouble has been expended is used to the best advantage. In every house, that which is proved to be a good servant will secure a large application; and the work of gas suppliers will not be done, nor will business potentialities have been realized, until gas is used at every possible point. Public service, in the fullest sense, should be the policy today of every gas undertaking. We believe in it, and not in any abstract sense, but because we have experienced in concrete form its advantages at the hands of more than one progressive gas undertaking, and, in common with some thousands of other consumers, have also experienced the disadvantages of the opposite policy—this not far from the present day, and in an extensive gas supply area, which, for our own peace of mind, shall be nameless. The hurried visits of the meter reader are the only personal connections the consumers have with this particular gas concern; for the rest, they are left coldly and perpetually to their own devices. The administrators of that Company have yet to learn the meaning and value of public service.

A Spiral-Guided Holder with Ferro-Concrete Tank.

The Spring Meeting of the North British Association had two features of marked interest. One was the paper by Mr. Laurence R. Hislop, of Dundee, on the 2¼ million c.ft. spiral-guided holder that has been constructed at Dundee; and the other was the visit to the Provan Gas-Works of the Glasgow Corporation to inspect the big installation of Woodall-Duckham vertical retort settings and other new plant which the Engineer and General Manager (Mr. J. W. M'Lusky) has in operation. It is to the former matter that on this occasion we wish to draw special attention. A spiral-guided holder of 2¼ million c.ft. capacity is in these days nothing remarkable in respect of size; but there are features associated with this one which make it a somewhat notable piece of engineering work, and which shows a boldness and assurance of decision by the Engineer, Mr. Hislop, and scrupulous care to ensure that the choice shall be justified. So far as spiral-guided holders are concerned, they have demonstrated their safety in all positions in which they are subjected to the most intense rigours of the weather. We have seen them in positions exposed to remorseless gales on the coast and in other places; we have heard of them (and Mr. Hislop reminds of this) operating perfectly in Norway and Canada, where wintry conditions and heavy falls of snow unsuccessfully oppose their normal functioning; and in China and South America they perform their duties under hot suns and high temperatures with the same consistency that obtains with more moderate climatic conditions. As we look back to the origin of this type of gasholder, and remember how the meticulous shook their heads at those daring engineers who had faith in holders without an external garb of guide-framing, and said it was madness, we can only smile—with Time's superlative evidence of a justified confidence before us. Now, in a position exposed to heavy weather from the North Sea, on a site not the most easily negotiated for the purpose of holder building, Mr. Hislop has planted another spiral-guided holder, and so has testified to his satisfaction with prior experience and his study of the principles involved. In fact, reading between the lines of his paper, there is a feeling that we shall not be wrong in saying that his view is that the spiral-guided holder has proved itself the most capable of positive action under onerous circumstances.

From the engineering standpoint, the most interesting feature about the new Dundee holder is the fact that, on a site not ideally accommodating in character for the purpose, and with physical conditions which will drastically test endurance, Mr. Hislop has adopted a ferro-concrete tank of monolithic structure; and this at present is the largest of the kind in the British Isles. Gas engineers will watch the record of the tank; but if exacting calculation can give assurance of constancy and reliability, then there will be no history attaching to this tank, despite its circumstances, other than that Mr. Hislop has legislated and hoped for. The site of the holder (which is only one of two that it will accommodate) has a rock base, in which were found large pockets which caused a great deal of delay and trouble—their nature being illustrated by the fact that one absorbed no less than 60 tons of concrete before being brought up to the required level. Even after the site was levelled, other pockets suddenly appeared due to loose rock sinking to the firm rock bed beneath. These required a further 70 tons of concrete. An old quarry was discovered which had to be filled with soft soil; but eventually all these troubles were overcome, and the tank was provided with a sound foundation. But there were other characteristics of the site which demanded great precautions. There is a continual flooding of the site with tidal water to within 3 ft. from the ground level; and this is one reason why a ferro-concrete tank was selected. Naturally, during the construction of the tank a large amount of water was encountered; but this was dealt with satisfactorily by an electrically driven centrifugal pump being kept running continuously. The tank (as already said) was designed as a monolithic structure to resist internal water pressure accompanied by outside earth pressure, and outside earth pressure when the tank is empty; due regard being paid in the latter case to the fact that during high tides the water in the ground rises to a high level. The forces in the first case are, of course, as Mr. Hislop points out, much greater than those in the second; but for a ferro-concrete structure, both conditions have to be carefully considered in order to determine the correct reinforcement to each side of the wall.

From the information given in the paper, it will be seen that Mr. Hislop fully satisfied himself as to an adequate margin of safety being provided for all stresses, having regard to the peculiar circumstances of the site. The tests applied show that a tight tank and holder have been realized. The ferro-concrete tank is 172 ft. 6 in. inside diameter; the extreme depth of the tank below ground is 28 ft.; and the part above ground line is 15 ft. The holder is a three-lift one—170 ft., 167 ft. 6 in., and 165 ft. diameter; and each lift is 32 ft. deep. The paper is full of details which will be of interest to those engineers who are contemplating the construction of a large ferro-concrete holder tank, and a storage vessel of the spiral-guided type.

Dehydrating Tar by Molten Metal.

In other columns, Mr. D. E. Garlick, of the Glastonbury Gas-Works, complies with a suggestion we made to him in the "Journal" for Oct. 24 last, that he should furnish our readers, after a period of working, with the operating and other costs attaching to the novel process of tar dehydration supplied to him, through the Woodall-Duckham Company, by the T.I.C. Company. In the same issue there was an illustrated descriptive article by Mr. Garlick of this first-stage process for the distillation of tar. Instead of filling the still with tar, it is supplied with a metal having a low boiling-point—the tar flowing over the surface of the metal in a thin layer. The dehydrated tar passes to a cooler, while the light oil and water vapour are driven from the layer of tar, travel from the top of the still to the condenser, and then on to the separator—the light oils flowing to storage. Small space, simple control, and a one-man job, the process is an attractive one; but previously we lacked data as to costs. These are now available, and are those that would be expected from a plant of such modest but efficient characteristics.

Before noticing the figures now supplied, there are one or two points that are interesting about the plant, and to its advantage, which were not formerly brought out, probably owing to the want of experience, and the disinclination of the makers to claim too much before putting the process to thorough test under actual working conditions. The plant was described as one having a rated capacity of 10 tons; but under its original working conditions at Glastonbury, Mr. Garlick stated the average throughput as being about 11 tons, with tar having a water content of approximately 3·6 p.ct. and a light-oil content of about 3·2 p.ct. Since then a larger crude-tar pump has been installed; and with this same small plant it has been possible successfully to dehydrate between 15 and 20 tons of tar per 24 hours. This proved increased capacity of the plant has, of course, where advantage can be taken of it, a material influence upon costs—labour costs per gallon or per ton particularly; and, in fact, upon all the charges per unit of tar treated. This is emphasized by Mr. Garlick's own conditions. The annual production of tar by his works is only about 30,000 gallons; and on this basis and a fifteen years' term of repayment (which is what the Ministry of Health will allow) interest and repayment represent 0·4d. per gallon. At 60,000 gallons the charge would be halved—0·2d. per gallon. In the costs now represented, it will be noted Mr. Garlick does not make his calculations on the actual capacity of the plant, but on his own conditions in respect of tar production, and prices obtained per gallon for crude tar (4½d.), dehydrated tar (8½d.), and light oils (8d.); and a very profitable showing he makes for a works even of the size of that at Glastonbury. If it were not for the stupid one-third bye-product purchasing restriction now imposed upon gas undertakings, there is no reason why this small plant should not deal with the tar production of all small works within easy distance. This is a splendid instance of a parliamentary enactment being deliberately framed to promote uneconomy instead of economy for the public.

The charges for dehydration in the circumstances of Glastonbury are summarized thus: Interest and repayment of loan, 0·4d. per gallon; working costs, 0·159d.; and maintenance and depreciation, 0·014d. This last-named figure shows the small amount of wear and tear there is upon the plant; and it is only equal to about 2½d. per ton of crude tar treated. The total charges, on the basis of the plant having to be worked far below its capacity, only amount to 0·573d. per gallon. From the tabulated statement accompanying Mr. Garlick's notes, one can clearly see the effect that the higher utilization of capacity would

have upon costs. Omitting interest and repayment (which as previously remarked decreases in proportion to the increased throughput of the plant), and taking labour, fuel, water, gas, and maintenance, the working costs per gallon would, with a throughput of 10 tons per twenty-four hours, be 0·173d.; 15 tons, 0·1298d.; and 20 tons, 0·1082d. At per ton, they would be respectively, £1 7s. 4½d., £1 10s. 9¾d., and £1 14s. 3d. In both instances—per gallon and per ton—the constituent items are clearly set forth by Mr. Garlick. In a balance-sheet, it will be seen that, charging the plant with crude tar at 4½d. per gallon, and adding the cost of dehydrating, interest and repayment, and maintenance and depreciation, the sale of the treated tar and the light oils gives a profit of £2 4s. 7¾d.—this (be it repeated) under the adverse condition that the plant is running much below the quantity of work of which it is capable.

The figures will, we imagine, have a big effect in inducing other gas engineers similarly and better circumstanced to consider whether there is not money in this for them. Many works, which need not do so, are still selling their crude tar, and by so doing are wasting both the cost of transportation and the profit to be made from a simple process of treatment.

Mining Subsidence and Gas Property.

The Royal Commission on Mining Subsidence will have an unenviable task in trying to produce, from the evidence submitted to them, a report and recommendations which, if adopted, will effect equity in relation to all interests which cause, and those which suffer, damage through subsidences. The gas industry is only one of the latter interests; but there are in our opinion reasons which entitle it to the special consideration of the Commission, as public safety is associated with the damage which subsidences may occasion to gas-mains. In fact the whole question, so far as gas supply is concerned, requires revision—including the concluding words of section 6 of the Gas-Works Clauses Act, 1847, which is three-quarters of a century old, and the decision in the famous case of the *Normanton Gas Company v. Pope*, which is forty years old. In this case the legal position in the matter of statutory gas companies was defined. They can obtain damages when these accrue upon each fresh subsidence due to mining operations; but the colliery owner may, on the other hand, institute arbitration proceedings forthwith for a lump sum to recompense him for the additional obligation imposed upon him in having to support the mains and service pipes of the gas company. This is the legal position. It was pointed out by Mr. T. P. Ridley, the Secretary and Commercial Manager of the Newcastle and Gateshead Gas Company, during his evidence, on behalf of the National Gas Council, before the Royal Commission, as reported in our news columns last week. But the legal position is a somewhat anomalous one. Seventy-six and forty years are long periods. During them the ramifications of underground workings have necessarily increased, and with them the liability to more frequent and serious derangement and damage to gas-distribution systems. In those same periods, too, the public service of gas supply has been magnified many times. Gas supply is now not only a public utility, it is a public necessity. With this growth in public service, the consequences of damage to gas-distribution systems may be considerably greater than they would have been under the conditions ruling 76 years ago. The circumstances have altogether changed; and this should be taken into account in the making of recommendations to realize protection for property in the subsoil and to assure public safety. The evidence of Mr. Ridley as to the legal positions of statutory gas companies, local authorities owning gas undertakings (their case is more difficult of explanation), and non-statutory undertakings was clear and much to the point. Non-statutory companies can only lay pipes by the consent of the local authorities concerned; and they cannot sue for damages to pipes due to mining subsidences, and therefore they have no remedy. In regard to principal works, they are only in the same position as private individuals. But in view of the fact that they are rendering public service, the same treatment, it is held by the National Gas Council, should be meted out to them as to statutory concerns.

So far as gas undertakings go, it may be said that as a general rule the structural damage caused is not the heaviest part of the loss occasioned. The greatest loss of all is from the waste of gas owing to the instability of the joints in the distribution system through movements of the subsoil and the fracture of mains. From what Mr. Ridley said, the Commissioners, we fancy, realize they are in touch here with a very serious question; but exactly what it all means is not at present very clear to them. This is evident from a remark made by the Chairman (Mr. H. R. Buchanan) to the effect that this is a very big matter, and that it carries them into the region of wide speculation. Towards the end of the sitting, too, the remark came from him that the figures given for unaccounted-for gas had not impressed him; and he would like to have further details. We have no doubt these will be supplied; and as various technical matters are involved, it would be well to have an expert gas distributing engineer to explain them. Mr. Ridley mentioned that about 6 p.ct. might be taken as normal for unaccounted-for gas; and in a summary of damages to structural works and mains and pipes, and gas and money losses, some striking figures were given, which demonstrated the gravity of the matter. All these considerable losses have to be met, and the consumers of gas—that is to say, the public—have to suffer heavily in a pecuniary sense. This ought not to be. But on the general question, it is impossible to produce any standards which can have universal application respecting unaccounted-for gas. Every district varies in respect of road use, vibration, physical characteristics of subsoil, and conditions that are friendly or hostile to the stability of a distribution system. Districts that are honeycombed by mining workings are in the worst plight of all. But no single year can tell the whole tale—the damage and losses vary from year to year, and therefore the measure of unaccounted-for gas. Always considerable in such areas, the loss of gas may one year through a greater degree of subterranean movement take a sharp upward flight, and continue at a high level until there is an opportunity for a thorough overhauling. We do not wonder that the Commissioners find themselves face to face with a speculative problem, and one upon which they require further details of an enlightening nature.

However, what the gas industry is, through the National Gas Council, asking the Commissioners for is full compensation for the damage done on the basis of the cost of repairs and reinstatement, compensation for the loss of gas, the satisfaction of third-party claims for damages caused by escapes due to mining subsidences, for cheap and expeditious machinery for settling questions of compensation due to subsidence, and finally that in the case of principal works gas undertakings, whether statutory companies or local authorities, should have the right to purchase coal for protection purposes by agreement or by reference to some tribunal. Mr. Ridley was asked whether he supported the idea of a Mining Subsidence Compensation Tribunal. His reply was that some form of settling who had to pay in the event of a dispute, and the amount to be paid, was essential. This was non-committal as to the form of the Tribunal, but it agrees with the principle of such a body being set up.

Cross Currents of Advice.

The miners are this week voting as to whether or not they shall reject the coalowners' amended offer for a revision of the wage agreement. The officials in the various areas are not of one mind on the subject. Mr. W. P. Richardson, one of the headquarters agents of the Durham Miners' Association, and Treasurer of the Miners' Federation, has urged the Durham miners to accept the owners' offer. The proposed settlement, he says, means a material improvement to the lower paid men. Mr. William Johnson, General Secretary of the Warwickshire Miners' Association, states that the leaders are not prepared to advise the men to strike. He considers it far better to carry on and ask for a Government inquiry. On the other hand, the Executive Committee of the Lancashire and Cheshire Miners' Federation and the Cannock Chase Miners' Association decided to recommend their members to vote for the rejection of the new offer.

Rebuff to the Wembley Opportunists.

It is not likely that the reprehensible two-and-a-half days' stoppage of work on the British Empire Exhibition will delay the opening; but there is little question that the enormous number of man-hours lost last week will have a retarding effect upon the presentation to the public of a finished exhibition on the 23rd.

It was just a case of opportunism. This army of men, led not by their own appointed union leaders, but by a few firebrands, thought they could bring about, through the stoppage of the exhibition work, a national increase of 2d. per hour in the wages of building operatives—a matter which has been the subject of negotiation between their own accredited leaders and the representatives of the masters. Violence, intimidation, and all the rest had their ignominious failure. Their own Union could not recognize the unauthorized strike; there was no strike pay; there was nothing but the foolishness and loss of wages attaching to the cessation of work. Large numbers of the men had no wish to strike; they were forced to down tools. The others who voluntarily relinquished work proved to the public that they had no sense of national or personal pride or honour, and no particular regard for law and order—not even for compliance with the rules of their own organized body. They were merely out for blackmail; and it is definitely said the action was due to Communist influence, which is exceedingly busy in our midst at the present time. Of this the Government are well aware.

Ash in Coke.

There are good reasons why coke should be as free as possible from ash. In a paper before the Northern Section of the Coke-Oven Managers' Association, Mr. J. A. Thornton pointed out that what the manager pays for is chiefly carbon, and any ash present displaces its equivalent amount of carbon. Then the ash has to be fluxed, with a consequent consumption of limestone. It absorbs heat and increases the amount of slag which has to be passed through the furnace, and be dealt with outside it. Moreover, ash above a certain percentage weakens the coke structure—in other words, it becomes brittle. Later in the paper, Mr. Thornton puts this into figures. He said that coke with a very low ash content is liable to be rather soft; but when it contains over 10 p.ct. of ash, the brittleness increases with the increase of the ash. Within 7 to 10 p.ct. of ash is probably conducive to the best grades of coke for furnace use. He expressed regret that no proper tests exist as to what is good or bad coke mechanically; but he recognizes the difficulty of prescribing a standard for coke suitable for all requirements.

Smoke Abatement and the Government.

The Government are already beginning to realize that those who in the political world are the protagonists of the smoke abatement movement intend to keep the matter well to the fore. During the past week, the question was raised in the House of Lords by Lord Newton asking, on behalf of Viscount Astor, whether the Government were contemplating introducing legislation to deal with smoke abatement. Lord Newton pointed out to the Government that those who oppose this are reactionary and obstinate. The reply came from Earl de la Warr that the Government realize the difficulty in this matter, but are anxious to do nothing which would hinder industries. The friends of the Government do a good many things, and in a most callous way, to hinder industries. A Minimum Wage Bill for the miners, for example, might do much more to hinder industries than a Smoke Abatement Bill. However, Earl de la Warr admitted there is considerable room for smoke abatement legislation. The scene shifted from the House of Lords to the Ministry of Health, where the Minister (Mr. Wheatley) received a deputation of members of Parliament and others headed by Lord Newton, whose object was to urge that steps should be taken by the Ministry to give effect to the recommendations of the Departmental Committee on Smoke Abatement. But it is apparent from the reply of the Minister of Health that the Government are not very desirous of loading themselves with fresh legislative proposals, however important. All Mr. Wheatley could promise was that the Department would consider how far it is possible to encourage and facilitate educational work in the provinces to help forward this movement; and that there would be sympathetic consideration of the question of a further Bill. The subject has received no end of "sympathetic" consideration—so far with a negative result.

Taxation of Motor Vehicles.

It is understood from the Minister of Transport that the Departmental Committee who are considering the question of motor vehicle taxation will probably be reporting next month, but certainly by June. There was a long discussion in the House last week on the subject of the iniquity of the present system of motor taxation (in that it bears no relation to the use and consequent wear and tear of the roads); and a motion was approved that the House recommends a system of taxation, based in the case of petrol vehicles on the use of motor spirit, and in the case of steam and electric vehicles on the weight of the vehicle. It was submitted that as 90 p.ct. of the motor spirit is imported, a flat-rate tax could be collected at the ports. Whatever is done, it is to be hoped that encouragement will in some way be given to home-produced motor spirit. The importance of the development of home production as a defence in time of war should not be overlooked. An interesting point bearing upon the question is that the estimated gross receipts from the taxation of motor and other vehicles for the financial year 1923-4, will be in the neighbourhood of £14,750,000. The amount available for grants, after deducting prior statutory charges, will be about £13,500,000. The grants sanctioned during the year towards the cost of maintenance and improvement of the existing roads (as distinct from new construction) amounted approximately to £13,750,000.

A Big Housing Scheme.

A Committee representing all interested in the building trade have prepared a report for the Government upon a proposed scheme for the erection of 3 million houses during the next fifteen years, or rather 2,500,000 houses, which is 500,000 less than it is anticipated the building industry will actually be able to carry out. There should be some good and continuous business in this scheme for the gas industry, providing there is no hitch in the matter.

Prevention and Tryanny of Strikes.

There is no prospect that the present Government will do anything to make strikes illegal, even for a limited period after a labour dispute has arisen. This was made plain a few days ago by Mr. Clynes, the Lord Privy Seal, in answer to questions in the House. According to his statement, the Government are convinced not only that trade disputes cannot be prevented by legislation, but that any attempt in this direction could not fail to be disastrous. Another question was by Mr. Penny, who asked whether, in view of repeated strikes, to the grave detriment of the community, the Government would take steps to repeal or modify the Trades Disputes Act. The reply was in the negative. And then Mr. Clynes had a "poser." He was asked by the same hon. member if he would say whether this country was to be governed by Parliament or be tyrannized by trade unionism? There was no reply. The Government are impotent where trade union matters are concerned. In other words, they are surrounded, through the company they keep, by very grave limitations in respect of those domestic matters that impede the material progress of the country.

Research in France.—Under the auspices of the Société de Chimie Industrielle, a National Office of Chemical Research is being formed. Already there has been created, through the inspiration of M. Gérard, the General Secretary of the International Union of Pure and Applied Chemistry, the nucleus of this vast organization. It will consist of at least six departments devoted to pure and applied chemistry, machinery, combustibles, metallurgy, agriculture, &c. A staff of specialists will select and register all useful documents. The Office will have a Press of its own; and the Library will contain all current scientific and technical periodicals and publications. It is hoped that a special service of bulletins, &c., will be available to subscribing manufacturers and laboratories.

Engine Cylinder Castings.—The second annual report of the British Cast-Iron Research Association states that further investigation and research have been carried out on the typical defective cylinders submitted by the British Motor Research Association, and interim reports have been issued. The influence of heat upon the expansion and permanent growth of motor pistons is being investigated, and a number of constants have been determined. These will be of considerable value to the engine designers. Further reports upon the extensive microscopic examination of representative cylinders, and upon the teaching of the work done so far (as suggesting directions for future design), are being prepared, and will be available for the members shortly, when the determinations of the whole series of physical and thermal constants are completed.

PERSONAL.

Mr. E. W. L. NICOL, M.I.Mar.E., A.M.I.E.E. Engineer and Fuel Expert to the London Coke Committee, has been elected an associate of the Institution of Civil Engineers.

Sir HENRY DENNIS READETT-BAYLEY, K.B.E., D.L., J.P., of Nottingham, coal owner and iron master, has joined the Board of Low-Temperature Carbonization, Ltd. Sir Dennis is Managing-Director of the Digby Colliery Company, Ltd.

The Gas Committee of the St. Ives Town Council, at a recent meeting, congratulated Mr. F. R. G. GRANT, the Manager, on the honour conferred upon him by the gas managers of the county in electing him President of the Cornish Association of Gas Engineers.

Mr. R. M. ALCOCK has been appointed Manager for London and Queenborough for Messrs. Settle, Speakman, & Co., Ltd., colliery proprietors, of Alsagar, Liverpool, Manchester, and Birmingham. Mr. Alcock has spent the whole of his business life with the firm, an association only broken by his service with the Forces (1914-19). He has had considerable experience in former years at Queenborough with the firm.

Mr. GEORGE WALKER, F.C.S., has been appointed gas examiner for the Morecambe Borough and the Heysham Urban District.

OBITUARY.

ARTHUR FREDERICK PHILLIPS.

With sorrow we gave intimation in last week's "JOURNAL" of the death, on the preceding Monday evening, March 31, of a great friend of everyone who knew him—Mr. Arthur F. Phillips. He had been ill for some ten days, and was unconscious during the last 48 hours before death, which took place at No. 176, Ashley Gardens, Westminster.

Mr. Phillips, who had reached the ripe age of 81 years, had spent a long life in the service of the gas industry, on behalf of which he had done far more good work than it is possible here to record, for he was always of a quiet and exceedingly retiring disposition, though ever courteous and kind to those with whom he came in contact. He was born in 1842 at Luton, where his father, Mr. William Phillips, was Engineer and Manager to the Gas Company, besides being Consulting Engineer to several gas companies in Bedfordshire and Hertfordshire. Having decided to join the gas profession—a choice which his subsequent career eminently justified—our friend duly qualified himself, and was appointed, in 1867, Engineer to the St. Albans Gas Company, and shortly afterwards Manager of the water-works in the same town. Other local appointments quickly followed, and soon he gained his first Continental experience, for in 1876 he went to Italy to value the Prato Gas-Works. The subsequent acquisition of these works was the foundation of the Tuscan Gas Company, Ltd., which he formed, and which proceeded to acquire some eighteen gas-works in Italy. Some of these were subsequently sold to the Communes, and the number now owned by the Company is twelve. The Tuscan Gas Company, like all other foreign gas concerns, passed through difficult times during the war; but the undertaking has done much better of late, and has been successful in renewing a number of the most important concessions, so that its future appears much brighter.

In Spain he acted as Consulting Engineer for the construction of the gas-works at Jativa and Denia; while the gas and water works of Figueira da Foz, in Portugal, were built to his plans and specifications, and under his supervision. He also carried out works in South America, having acted in an advisory capacity to the City of Santos Improvements Company, and to the San Paulo Gas Company. Other countries in which he was consulted in connection with the investigation of gas and water schemes included Russia and Greece.

In this country the services of Mr. Phillips were no less eagerly sought after, for his reputation as an experienced gas and water engineer stood very high. He carried out many extensive works of construction, extension, and remodelling, in connection with gas and water undertakings, and was widely retained as Consulting Engineer. In his capacity of Engineer to the late Duke of Norfolk, he executed several schemes at Arundel, including the water supply of the castle and of the town. Mr. Phillips had much experience in the Parliamentary Committee rooms, and his work in the valuation of gas and water undertakings in Great Britain was no less important than that which he did abroad.

In 1905 he was appointed a Director of the Continental Union Gas Company, and subsequently Engineer to the Compagnie l'Union des Gaz, of Paris. He constructed new gas-works at Genoa and Milan, and advised on extensions at many of the works of those companies. He was also Chairman or a Director of a number of other gas and water companies, all of whom, it is safe to say, profited greatly by his valuable counsel. Among these, it may be mentioned that he was Chairman and Managing Director of the Anglo-Portuguese Gas and Water Company, Ltd.; Chairman of the Barnet District Gas and Water Company, the Colombo Gas and Water Company, Ltd., the Harrow and Stanmore Gas Company, and the Hongkong and China Gas Company, Ltd.; Deputy-Chairman of the Woking Water and Gas Company; and a Director of the Brighton and Hove General Gas Company, the Hornsey Gas Company, the Lea Bridge District Gas Company, the Malta and Mediterranean Gas Company, Ltd., the North Middlesex Gas Company, the Ottoman Gas Company, Ltd., and the Southgate and District Gas Company. As one of his latest successful operations will be remembered the negotiations which resulted in the recent amalgamation of the Harrow and Stanmore Gas Company with the neighbouring Brentford Gas Company.

Mr. Phillips commenced practice in Westminster in 1886, at Great George Street, and in 1894, when the street was re-modelled, removed to No. 38, Parliament Street. Subsequently he had offices in Caxton House, and when these were requisitioned by the War Office during the war, he removed to No. 82, Victoria Street. He was elected an associate of the Institution of Civil Engineers in 1873, and a member in 1883. He was also a member of the Institution of Gas Engineers. For some years he was on the Council of the Society of Engineers, but retired in consequence of his engagements abroad not permitting him to become President. In addition to his many other appointments, he was a Justice of the Peace for St. Albans. He married Jane Elizabeth, daughter of the Rev. C. B. Harris, Rector of Skilgate, Somersetshire, in 1868, and resided for many years at St. Albans, but latterly at Ashley Gardens.

The Funeral.

The funeral took place at St. Albans last Friday. Carriages on the 1 o'clock train from St. Pancras were filled by a number of friends travelling from London to join in the tribute of homage due to the memory of one whose conduct in life surely entitled him to the designation of a typical English gentleman. As the train sped through the quiet Hertfordshire countryside, which was just giving evidence of returning animation, reminiscences were exchanged of incidents in which Mr. Phillips had signally exemplified those qualities by which he had endeared himself to so many with whom he became associated in the course of his numerous professional and other activities, sustained right to the end. Arrived at St. Albans, the party was motored to the Cathedral, where a memorial service was most impressively conducted by the Dean of St. Albans, the Very Rev. G. W. Blenkin, M.A., assisted by the Rev. Canon George H. P. Glossop, M.A.

In the large congregation assembling were many well-known Directors and officers of the various Companies with which Mr. Phillips had identified himself. These included the Gas Companies of Hemel Hempsted, Berkhampsted, Dunstable, and Hatfield; the Anglo-Portuguese Gas and Water Company, Barnet District Gas and Water Company, Brighton and Hove General Gas Company, Colombo Gas and Water Company, Continental Gas Company, Gas-Meter Company, Harrow and Stanmore Gas Company, Hornsey Gas Company, Hong Kong and China Gas Company, Lea Bridge District Gas Company, Malta and Mediterranean Gas Company, Ltd., National and Foreign Securities Trust, Ltd., North Middlesex Gas Company, Ottoman Gas Company, St. Albans Gas and Water Companies, Woking Water and Gas Company, and the Tuscan Gas Company. The Institution of Gas Engineers and the National Gas Council were represented by their respective secretaries, Mr. Walter T. Dunn and Mr. W. J. Smith; and among those engaged with Mr. Phillips on the technical side of his work were noticed Mr. Leonard Askew (his chief of staff), Mr. Francis J. Bancroft (Barnet), Mr. J. W. Buckley (Hornsey), Mr. Charles Chambers (Harrow), Mr. Fredk. W. Cross (Lea Bridge), Mr. Samuel Cutler and Mr. Walter Fendick (Hemel Hempstead), Mr. William Phillips (Luton), Mr. C. H. Rutter (Brighton), and Mr. Lawrie Trewby (Mill Hill).

The introductory selection by the Organist of the Cathedral, Mr. W. L. Luttmann, F.R.C.O., Mus. Bac., was most expressively rendered. To the tolling of the old Abbey bell, the cortège entered, Mrs. Phillips, supported by her son Ernest, leading the procession of mourners. "I know that my Redeemer liveth" was heard; and then from the choir the psalm "Lord Thou hast been our Refuge," beautifully rendered, as was also Tennyson's "Crossing the Bar" to the setting of Sir Frederick Bridge. The other parts of the time-honoured ritual of the Church of England were observed; and as the coffin was being borne away a most sympathetic interpretation of "O Rest in the Lord" came from the organ.

The interment took place at St. Albans Cemetery, about a mile-and-a-half away. We heard the committal sentences said, the final blessing pronounced, and then bade our friend a last farewell.

The death occurred on March 27 of Mr. E. T. T. WHITFORD-HAWKEY, Chairman of the St. Colomb (Cornwall) Gas Company.

The death has occurred, at Harrogate, at the early age of 38, of Mr. ERNEST DENT, a Director of the firm of Messrs. Dent Sons & Co., Ltd., tar distillers, of Selby.

The University of Michigan.—We have received a bulletin announcing the courses in chemical and metallurgical engineering at the University of Michigan. The engineering building has 75 rooms, with 60,000 sq. ft. of floor space. The gas-engineering laboratory contains furnaces for the manufacture of gas on a small scale, and apparatus for measuring and testing the finished product. Prof. A. H. White is head of the chemical engineering department.

ELECTRICITY SUPPLY MEMORANDA.

At one of the series of salesmanship conferences organized by the Electrical Development Association, the platform was occupied by Mr. E. E. Hoadley, the Borough Electrical Engineer of Maidstone. He took as his subject "Electricity—The Real Domestic Help." Of course, it is a help; it helps to increase the domestic outlay, even when used with the most refined care. Mr. Hoadley had little to say about gas in respect of heating and cooking. He is one of those who find sufficient scope for electricity by assigning to it a part in suppressing the burning of raw coal. He made his comparisons with coal, and so gave utterance to none of those pungent remarks regarding gas which some fiery and extremely foolish electrical men make. Such men fail to see that they cannot destroy the fact that coal is by carbonization divisible into various products, all of which are valuable to industries, and the gas the same to both domestic and industrial service. Their inane words cannot change this; nor can they displace the facts that the gas supplies, for equal sums of money, more potential heat than can be realized by electricity, and that the efficiency of gas appliances, good already, is being still further improved. Some people appear to be incapable of recognizing facts when they meet them; and they think that a little silly traducing will completely extinguish them. Mr. Hoadley is not one of these. If the merits and economies of electricity are as high as is represented, nothing will stop the current flowing into all the places now served by gas. But there are no signs of this happening. Gas must have existence (apart from its necessity in our economic system) unless other industries are to become more or less extinct. But Nature's provision for man's use, and in economical and efficient form, cannot be suppressed solely in the interests of electricity supply undertakings. It would be well if the salesmen of that industry were instructed to take a sane view of things, and not allow observers to think that they are incapable of exercising a broad intelligence.

Facts and Style.

Practically the only place in which Mr. Hoadley referred to gas was in connection with lighting. He seems to have had a bad experience. He finds that both oil and gas lighting involve a "very considerable amount of dirt." We do not know why gas should. There is no reason for "dirt" from a properly regulated bunsen flame. Perhaps investigation by Mr. Hoadley would reveal another source for the dirt. But supposing economical inverted incandescent lights did give off an amount of "dirt," that is far better than being the cause of damage to the eyesight. There we think Mr. Hoadley overstated the case against gas-lighting. He goes on to heating, and has to admit that electricity has not got to the stage where it is in general use for the warming of an entire house. We do not want to hurt our friend's feelings; but we think he would be an extremely bold man if he contemplated the universal heating of houses by an agent which necessitated the expenditure of nine or ten times its own thermal value to produce it. The fact that electricity is not used throughout for heating houses is, in Mr. Hoadley's opinion, due first to expense, and secondly to the innate conservatism of the average Englishman, who prefers a coal fire chiefly because his ancestors had one, and because with an electric fire there is nothing to poke. That, of course, is not a sound submission. The average Englishman is not wedded to what his ancestors did. If he were, gas would not have made the progress it has done, and is doing; electricity would not have got established at all; motor vehicles would have been rejected and horse-drawn vehicles would still have ascendancy; and there would be no aircraft. The average Englishman is not such a fool that he will continue to do things in the same old way because it was that of his ancestors. Mr. Hoadley must look for some other reason, or place greater stress upon his first one. Still, our Maidstone friend holds that not only is it more desirable, but actually cheaper in a large number of towns, to warm rooms that are only wanted for a few hours per day by means of electricity than it is by the use of a coal fire. He does not tell us what he means by a "few hours;" and he does not give any arithmetical demonstration that electricity is actually cheaper. He would probably build up a case by pricing out the labour involved by the coal fire. In fact, our cheery electrical friend thinks that in a great majority of the dwellings of the people where there is either one servant or no servant at all, electricity would be voted for with both hands as a heating agent "provided it could be installed without much initial expense." We cannot share this view with him, while there is another labour-saving agent which will perform the same heating work at less expense, and which has therefore a larger scope. It is not initial expense only; it is the capacity of another agent for doing the same thing more economically. However, naturally Mr. Hoadley's belief is strong. From actual experience as a user, he says: "I am convinced that there is an enormous field for electrical heating as yet untouched, and that when the ways and means are brought within the range of families with little money, users of electric heating will be as plentiful as users of electric light." An electrical expert is not an ordinary user, and the time is far away, if ever it arrives, when electrical heating ways and means will be brought within the range of families with little money.

Heating and Cooking.

Optimism is an excellent trait in business, so long as it does not cause any slackening of effort. Speaking of cooking by electricity, Mr. Hoadley says the fundamental idea is so good that nothing can stop its becoming the premier method for cooking. Its very cleanliness must ensure this. The "cleanliness" has not so far done much to make cooking by electricity popular. There are other factors that count with the mass of the people, who are quite content with the cleanliness, economy, and range of application of gas. For sixteen years Mr. Hoadley has had experience of cooking by electricity in his own house. During that time, he has never been let down by a failure of supply or of apparatus, although there have been the "usual" failures of elements. Mr. Hoadley's experience has been vastly different from that of many other users. Failures of supply have occurred in many towns, and fairly frequently; and failures can and do happen in all sorts of places between generating plant and points of utilization. Then we come across another point that Mr. Hoadley claims—the reliability that the same result can be repeated day after day. This we take it is attributed to the fixed heats. We will not dispute that the same results can be repeated. But from what we have heard from users of electric cookers, the results which can be repeated day by day are not always desirable or preferable; and chefs have told us that, for the great variety of cooking they have to perform, they require not three or four fixed heats, but a long range, and this they can get with gas at any time. Then he came to the boiling-plate. He says that in pushing the sale or use of electric cookers, electrical men are often twitted with the slowness of boiling. Even if this is a drawback—and he does not admit that it is—he asserts that it is being very quickly got over; and he is now actually using some 8-in. hotplates of 2000 watts at which no charge of slowness can be levelled. Perhaps they will be too fierce; and what about their life? Electric cooking and boiling operations are fenced in by material drawbacks; and no one knows this better than electrical men. In the discussion which followed the paper, more than one speaker advised that electrical men should not dwell too much on the cost of electrical heating and cooking; but should concentrate on the counterbalancing economies and advantages. We are not surprised.

More Optimism.

Curves have appeared in the "Electrical Times" purporting to show the effect of electric cookers on the station load. They refer to Hackney and Norwich. We do not know how they can be taken to furnish concrete evidence of the value of the cooking load; but they are supposed to do so. They apply in both cases to winter days; and we imagine some of the users of electric cookers on those days also consumed current for other heating purposes. Regarding Hackney, the load curves are at the Northwold Road sub-station for Friday, Jan. 5, 1923, and Friday, Jan. 4, 1924, respectively. The figures were taken for seventeen hours, from 7 a.m. to midnight. Whereas on Jan. 5, 1923, the maximum load was 1615 kw., it had increased in twelve months to 1875 kw. In the same period the output increased from 14,326 kw.-hours to 19,196 kw.-hours, and the load factor improved from 52·3 to 60 p.ct. One of the curves compares the total direct-current load curve for Sunday, Jan. 7, 1923, with that of Sunday, Jan. 6, 1924. Here, again, the period considered is seventeen hours—7 a.m. to midnight. The increase in output was from 15,735 kw.-hours to 23,720 kw.-hours; the maximum load rose from 1840 to 2610 kw.; and the load factor improved from 50·3 to 54 p.ct. Regarding Norwich, Sunday load curves are shown on Dec. 10 and 17, 1922, and those for the corresponding dates Dec. 9 and 16, 1923. In this case, the period taken is from Saturday midnight to Sunday, 10 p.m. During the year, 456 cookers were connected to the mains; and it is suggested that a hump in the load curve from 8 a.m. to 2 p.m. clearly shows their beneficial influence on the load curve. A shaded section indicates the output directly attributable to the cooker load; and this is redrawn on the base line, from which it is said the maximum load is just over 8000 kw. The effect of the 456 cookers connected to the Norwich main last year it is suggested is indicated by the following figures: Connected load, 2370 kw.; and units consumed, 586,500, representing a revenue of £2443 per annum at 1d. per unit. The over-all load factor is estimated at 15 p.ct., and the demand factor at 20 p.ct.

Is it the Cooking Load?

Electrical people will have to see what can be done to curb the veracity of newspaper reporters. These gentlemen are getting bolder when dealing with fires than was at one time their wont. When electricity was strongly suspect as the cause of a fire, it was a common thing for the newspaper man to say that the fire is "attributed to," or is "supposed to have been caused by," a short circuit or fusing of the wires. Now it is noticed that the "Daily Telegraph," in reporting the fire on March 30 at Eaton Hall, states that it "was due" to the fusing of an electric wire. There is no ambiguity about that—nothing could be more positive. But since then, Messrs. Baxter and Co., Solicitors, have written to the papers to say that the fire was not due to electrical, but to other causes. However, the Duke, assisted by his guests and the Hall staff (and later by the Chester Fire Brigade), succeeded in extinguishing the outbreak, but not before damage to the extent of £500 had been done. On Thursday, a report was published in the papers of a terrible cinema disaster

Fires and Electricity.

in Mexico City, when 26 persons were electrocuted. There was a cry of fire, people lost their heads, and there was a desperate rush for the doors. In the midst of this, an electric wire running across the roof fell close to the floor. According to the report, those persons whom it touched dropped dead immediately, and several others rushed blindly into it, and were electrocuted. Others fell over the bodies, and were caught by the wire and killed. In addition to those who were killed, 56 persons were taken to the hospital suffering from injuries of varying seriousness. The report also says: "It is established that the outbreak of fire was caused by an electric wire short-circuiting." Will the "Electrical Review" kindly note—lest it forgets.

The "E.D.A." Increases Its Membership.

The Electrical Development Association has been making a good development of membership. In the annual report of the British Electrical and Allied Manufacturers' Association for the year ending September last, it is stated that the membership of the "E.D.A." has risen from 691 to 1166. The membership of the four main classes now stands as follows: Municipal undertakings, 97 (last report, 87); company, 85 (79); manufacturers, 244 (296); contractors and wholesalers, 740 (229)—total, 1166 (691). It is explained that the drop of 52 in the manufacturers' class results from a regrettable error in last year's figures, which a careful scrutiny disclosed; but it is more than compensated for by the large increase in the contractors' class—from 229 to 740. The increase in membership, it is remarked, "points to increase in usefulness and prestige; and the 'E.D.A.' has during the year won increased recognition from the Press, the learned institutions, and leaders of opinion, and has extended the scope of its operations in various directions." From the foregoing figures, it seems that the contractors—most maligned of electrical men—are numerically the chief supporters of the Association.

PASTURES NEW.

Electricity Promotions and Prospectuses.

THE name of Eaton—now "Lieut.-Col. E. Eaton, C.E."—and that of the dear old baronet Sir Charles B. H. Soame are well known to the older readers of the "JOURNAL" as having been associated with various small gas company promotions which subsequently and unerringly passed into the hands of receivers. The methods adopted to obtain money for these concerns are now being applied to the electricity industry. The same thing is happening—little undertakings are given big names, and for them big capitals are required. Gas has now no place for these promoters. Saturation mark has evidently been reached. We have seen something of this in the recurring prospectuses of the Warwickshire and South Midlands Electricity Supply Corporation and of the Wareham Electric Supply Company, Ltd. There have been various references to these in the "Electricity Supply Memoranda;" the last one being on March 19. Now another prospectus reaches us in respect of the Chagford and Devon Electric Light Company, Ltd., for which concern the Lighting and Power Finance Corporation, Ltd., of which Mr. A. M. Eaton is one of the Directors, have been "authorized to offer for sale" 2650 cumulative 9 p.ct. preference shares of £1 each, 5528 ordinary shares at the price of £1 each, and 418 7½ p.ct. guaranteed first-mortgage debentures of £5 each at par, with accrued dividend (redeemable on or before Jan. 1, 1930, at a premium of £10 p.ct.) The debentures, it is said, are guaranteed as to repayment of the principal at maturity on Jan. 1, 1930, and with the premium of 10 p.ct. on redemption show a yield of £8 15s. p.ct.—that is to say, £100 invested now would yield at maturity (including principal repayment, interest, and premium) £148 15s., as from the date of this offer.

There is something which requires a little explanation between the authorized share and debenture capital, the amount issued, and the present offer of further capital. According to the prospectus, £5000 9 p.ct. preference shares were authorized and £5000 have been issued and paid up. Notwithstanding, 2650 are now offered. The ordinary shares are particularly interesting. The authorized sum is £2000 in 8000 ordinary shares of 5s. each; and the amount issued and paid up is £1179. It will be noted that the ordinary shares have a nominal value of 5s. each. The present offer is of 5528 ordinary shares "at the price of £1 per share." Does this mean 5s. shares at £1 each? But there is a nice little bait in the statement that the ordinary shares are unrestricted as to dividend, and therefore, after the payment of the preference share dividend, are entitled to rank, with balance of the net profits remaining and available for distribution, up to 91 p.ct. thereof. It is noted from the circular-letter accompanying the prospectus that the Lighting and Power Finance Corporation, Ltd., are "specialists in electrical construction, finance, and investment." Regarding "electrical construction" we are not prepared to regard the "Corporation" as specialists; but in the matter of finance and investment, the claim to being "specialists" might hold good.

We will not go further into the statements in the prospectus beyond to quote and remark upon this paragraph: "The Chagford and Devon Electric Light Company, Ltd., has been established over thirty years, and is utilizing water power for the generation and supply of electricity in the *County* of Devon*shire*." These people are certainly not specialists in composition. The county of Devon, too, has a large area, just about in harmony with the pretensions of these company promoters. There is a grave omission in the prospectus so far as "investors" are concerned. The Company, it is said, have been established over thirty years; there is no statement as to the profits earned during that period. Already the capital issued and paid up is £8000. Investors will, in our opinion, do well to keep clear of the Chagford Electric Light Company.

STANDARDS OF COMPARISON IN CONNECTION WITH THE THERMAL EFFICIENCY OF INTERNAL-COMBUSTION ENGINES.

Committee on Tabulating the Results of Heat-Engine Trials.

At last night's joint meeting of the Institution of Civil Engineers with various other organizations who are co-operating in the work of the Special Committee on Tabulating the Results of Heat-Engine and Boiler Trials, there was submitted for discussion the question of "Standards of Comparison in connection with the Thermal Efficiency of Internal Combustion Engines." It was introduced by Mr. G. J. Wells, Wh.Sc., Assoc.M.Inst.C.E., in a detailed paper, the contents of which are here indicated.

Engineering progress demands the revision of standards and ideals from time to time, and the Committee which has recently been appointed to revise the report of a previous Committee on the tabulation of the results of steam-engine and boiler trials (revised 1913) will, by virtue of the extension of its terms of reference, require to consider certain questions dealt with by an earlier Committee which reported on the efficiency of internal combustion engines (1905).

The 1905 Committee reported in favour of the air standard as the then best ideal with which to compare the performance of internal-combustion engines, using air as the standard ideal working fluid, the specific heat of which was assumed to be constant. The Committee stated definitely that these conclusions were only regarded as a temporary expedient, until such time as the requisite data were obtained, to render possible a restatement of the ideals to be aimed at. Sir Dugald Clerk, Prof. Burstall, the late Prof. B. Hopkinson, and others have done research work which has widened our knowledge; and the critical and analytical work of others all help materially towards more rational definitions of ideals and standards. The ideal simple standard cycles applicable are the well-known constant-pressure and constant-volume, together with the Diesel and dual combustion; the last two being combinations of the first two mentioned. The thermal efficiencies of these cycles are stated usually in terms of temperature or of the compression ratio; but it is proposed to compute the efficiency in terms of the energy supplied and rejected in each cycle.

As regards the working fluid, it appears possible to replace the imaginary air with constant specific heat by means of a gas mixture the properties of which approximate more closely to those possessed by the actual gas mixture found in internal-combustion engines. The work of Sir Dugald Clerk, the British Association Committee on Gaseous Explosions, and a formula proposed by Dr. Stodola are examined and shown to be more closely in agreement than might be expected from the numerical values attached to the constants; and upon these a proposal is based that an imaginary fluid may be postulated with properties that give on the whole a fair approximation to the actual truth, certainly much closer than the air standard can achieve. The solution suggested is that, by means of a diagram (nomographic) and data given by a mean indicator diagram, the temperatures and changes of total and internal energies may be found in a manner somewhat similar to that employed in conjunction with a Mollier chart for turbine problems. A sample table is added giving the internal and total energies reckoned from absolute zero of temperature—a sort of table of properties of gases for the use of internal-combustion engineers. An entropy chart is also combined with the nomogram, which enables the actual engine heat cycle to be readily compared with the suitable ideal cycle, thus giving directly a visual impression of the engine's departure from the ideal, and a quantitative measure of the relative efficiency. The chart thus built up is then tested by means of published tests of a gas-engine and two Diesel engines. In the case of the gas-engine, three tests were published, and the efficiency figures found by means of the diagram were 0·360, 0·359, and 0·357, as compared with the figure 0·3535 computed and published at the date of the tests. The diagram gave a mean pressure of 89 lbs. per sq. in., which agrees exactly with that obtained from the cards. Similar results are obtained in the latter case.

Finally it is claimed that the time has arrived when engineers should take the fullest advantage possible of the advances made in the knowledge of the behaviour of the gases in internal-combustion engines, and revise their standards and ideals for use in internal-combustion engine problems.

Alderman THOMAS WILLIAM THURSFIELD, M.D. F.R.C.P., J.P., Chairman of the Leamington Priors Gas Company, who died at Kidderminster last January, aged 84, left estate of the gross value of £78,272, with net personalty £76,803.

THE TAR DEHYDRATION PLANT AT GLASTONBURY.

By D. E. GARLICK.

In your editorial notes in the "JOURNAL" for Oct. 24 last, on the article describing the new tar-dehydration plant erected at our works by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., under licence from the Thermal Industrial and Chemical (T.I.C.) Research Company, Ltd., you kindly expressed the hope that I would give particulars in the near future as to working costs; and I have now much pleasure in doing so.

Since the above date the makers have installed a larger capacity crude-tar pump, in place of the one supplied when the plant was erected. The plant has a rated capacity of 10 tons of crude tar to be dehydrated per 24 hours; and the larger pump was installed for the purpose of testing the plant with an increased throughput. With this pump we have been able successfully to dehydrate between 15 and 20 tons of tar per 24 hours. This increased throughput considerably reduces the labour cost per ton of tar treated, as, even at the higher rate of working, one man only is required to attend to the supply of crude tar to the plant, the firing of the furnace, the disposal of dehydrated tar, light oils, and liquor, and the raising of the steam required for the pump and the forced-draught furnace.

The schedule of working costs which I append may be of interest to your readers. With regard to the capital cost, the Ministry of Health sanctions loans to local authorities owning gas undertakings for the installation of these plants on a 15 years' term of repayment. The annual production of tar from these works is only about 30,000 gallons; and on this basis the amount of interest and repayment of loan for the plant represents 0·4d. per gallon of tar treated. In the case of works with a larger annual production of tar, the cost per gallon, for interest and repayment of loan for the dehydration plant, would be proportionately less, as follows:

Production of Crude Tar per Annum.	Cost per Gallon. Interest and Repayment of Loan. d.
30,000 gallons ..	0·4
60,000 ,, ..	0·2
&c.	&c.

This cost can be further reduced if crude tar is purchased, for treatment in the dehydration plant, from small gas undertakings which have no facilities for dehydration. The amount of such purchases may not, however, exceed one-third of the quantity of the crude tar produced in the year at the purchaser's works.

The charges for dehydration may be summarized thus:

	d.
Interest and repayment of loan . .	0·4000 per gallon.
Working costs	0·1590 ,,
Maintenance and depreciation . . .	0·0140 ,,
Total	0·5730

The prices obtainable for crude tar, dehydrated tar, and light oils in buyer's casks at these works are as follows:

	d.
Crude tar	4½ per gallon
Dehydrated tar	8¼ ,,
Light oils	8 ,,

The attached balance sheet shows a good margin of profit from the sale of dehydrated tar and oils. If the plant were worked for 24 days, at the rate of 10 tons of crude tar dehydrated per 24 hours, the surplus revenue—at the figure shown on the balance-sheet—would more than cover the initial cost of the whole installation, inclusive of foundations.

GLASTONBURY CORPORATION GAS-WORKS.

Tar Dehydration Plant—"T.I.C." Process.

Rated capacity, 10 tons of crude tar dehydrated per 24 hours.

BALANCE-SHEET.

	£ s. d.		£ s. d.
1 ton (190 gallons) of crude tar at 4½d. per gallon .	3 11 3	174 gallons of dehydrated tar at 8¼d. per gallon .	5 19 7½
Cost of dehydrating 1 ton of crude tar at the rate of 10 tons per 24 hours, including all labour, fuel, water, and steam	0 2 6¼	8 gallons (3·4 p.ct. by weight, approximately) of light oils at 8d. per gallon.	0 5
Interest and repayment of loan for the plant for works producing 30,000 gallons of tar per annum at 0·4d. per gallon (190 gallons = 1 ton) . .	0 6 4	8 gallons (3·5 p.ct. by weight, approximately) of ammoniacal liquor .	—
Maintenance and depreciation	0 0 2½		
Balance—profit per ton of tar dehydrated . . .	2 4 7¾		
	£6 4 11½		£6 4 11½

Working Costs of Plant

Items.	Costs: Per Day of 24 Hours At Rate of Throughput of Crude Tar per 24 Hours as under.			Costs: Pence per Gallon of Tar. At Rate of Throughput of Crude Tar per 24 Hours as under.		
	10 Tons.	15 Tons.	20 Tons.	10 Tons.	15 Tons.	20 Tons.
LABOUR. For working tar-dehydration plant, attending to supply of crude tar to the plant, and the disposal of dehydrated tar, oils, and liquor, and the raising of steam required	£1 0 6	£1 0 6	£1 0 6	0·1295	0·0863	0·0647
FUEL. Coke breeze for the forced-draught furnace, and for raising steam for the crude-tar pump and the furnace blower . .	2 10	4 3	5 8	0·0179	0·0179	0·0179
WATER. For the vapour condenser, and for the boiler for all steam consumed at the plant	1 2	1 9	2 4	0·0074	0·0074	0·0074
GAS. For the gas-engine driving the works tar pump to deliver crude tar from storage to the tar-feed tank at the plant	8	1 0	1 4	0·0042	0·0042	0·0042
MAINTENANCE AND DEPRECIATION*	2 2½	3 3¾	4 5	0·0140	0·0140	0·0140
Total working costs—at throughput rates stated—per 24 hours .	£1 7 4½	£1 10 9¾	£1 14 3	0·1730	0 1298	0·1082

* NOTE.—Maintenance and Depreciation: The rated capacity of the plant being 10 tons of crude tar per 24 hours the charge under this item is rated at 6·6 p.ct. of the initial cost (inclusive of foundations and tar-feed tank) assuming that the tank is worked for 300 days per annum at the 10-ton rate. For the higher rates of throughput the charge has been proportionately increased.

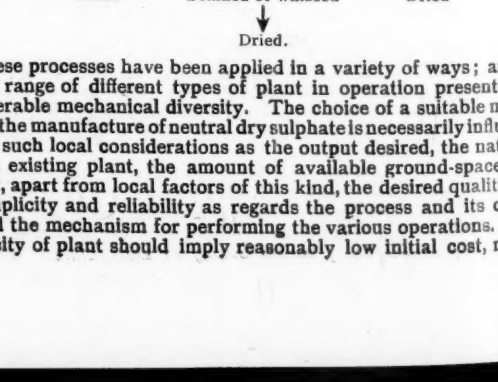
OBSERVATIONS ON THE MANUFACTURE OF NEUTRAL DRY SULPHATE OF AMMONIA.

By H. J. HAILSTONE.

Part I.—General Principles.

Apart from marketing factors, the advantage of making neutral sulphate in dry condition lies in the enhanced price obtainable under two heads—(*a*) absence of free acid, and (*b*) absence of lumps. The following few remarks are intended to place before the industry a brief statement of the principles involved in the manufacture of the improved product.

With the exception of the "Bedford" process, which employs a double saturator, all existing methods are similar in so far as the sulphate is taken from the saturator in acid condition. Up to this point, sulphate-making practice is more or less stereotyped in both large and small scale plants; little modification having been made during the last twenty years. It is in the subsequent treatment of the ordinary acid product that difficulties, chiefly of a mechanical nature, have arisen; but several different methods have been successfully put into practice in various parts of the country. A rough idea of the available processes may be conveniently summarized thus:



These processes have been applied in a variety of ways; and the full range of different types of plant in operation presents considerable mechanical diversity. The choice of a suitable method for the manufacture of neutral dry sulphate is necessarily influenced by such local considerations as the output desired, the nature of the existing plant, the amount of available ground-space, &c.; but, apart from local factors of this kind, the desired qualities are simplicity and reliability as regards the process and its control and the mechanism for performing the various operations. Simplicity of plant should imply reasonably low initial cost, moder-

ately low labour costs, and low maintenance; and it should be noted that this becomes increasingly important when dealing with the smaller plants.

Saturator Conditions a Governing Factor.

When removing salt from the saturator, in order to reduce subsequent treatment, it is obviously desirable for the fishing to be conducted at the lowest strength practicable—the actual figure varying in different plants. Moreover, the crystals should be of large grain. These points are of primary importance, and have a great bearing upon the quantity of free acid and moisture retained by the salt after draining or whizzing, and hence govern the amount of neutralizing medium required. Furthermore, small crystals are apt to give rise to difficulty during the drying operations. Whether the fished salt is drained upon a table or in a whizzer, identical physical processes are at work, and any increase in the size of the crystals promotes more complete drainage of the acid mother liquor, chiefly owing to the relative decrease of surface area and capillarity. The rapidity and degree of drainage is therefore largely predetermined by the size of the crystals fished from the saturator. The graph (fig. 1) illustrates this point, and shows how very rapidly the relative surface area of the crystals decreases as the size of the crystals increases.

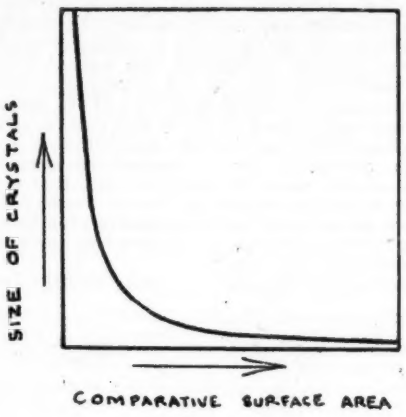


Fig. 1.

There does not appear to be a clear idea of the exact saturator conditions responsible for ensuring a large-grain salt. No doubt the constructional details and capacity of the saturator have considerable bearing on the matter, no less than the conditions of the bath at the time of fishing. The writer's experience (borne out also by other workers) is that for a given plant larger crystals are obtained when working-up weak liquors than with stronger liquors, though exactly why this should be so is not clear. Enlightened views bearing upon this particular matter would be of great value, and would be welcomed by the industry, as there does not appear to be any recorded information dealing with this point.

Separation of the Mother Liquor.

With regard to the first draining operation, whether conducted in the whizzer or on a table, this should take place with all speed while the salt is still warm. The fitting of a perforated bottom to the draining table ensures quick separation of the acid mother liquor, and allows a much drier product to be obtained than hitherto. With the table drainer a good depth of salt is also an advantage, and if not already provided for entails piling the sulphate by hand. This thicker bulk of salt retains its heat for a longer period, and enables more complete drainage to occur in a given time. The relative advantages of drainer or whizzer will not be discussed here, since their adoption is primarily dependent upon the output of the plant—large-scale operations necessarily demanding rapid mechanical handling and quick throughput, in order to keep pace with the production and to confine the plant to reasonable dimensions. But for plants turning-out up to four tons, and probably more, per day, it appears that a drainer may be substituted with advantage for the expensive high-speed centrifugal machine. This procedure eradicates the troubles due to copper-basket corrosion, and simplifies the mechanism required.

Neutralization.

After adequate draining or whizzing comes the neutralizing process; and no matter whether this is performed by a gaseous, liquid, or solid medium, a dense mass of small crystals is naturally more difficult to treat completely, owing to the reduced permeability and greater surface area already referred to. Consequently, more reagent will be required and a longer time allowed than if large crystals are treated. With the use of solid or gaseous reagent the operation may, if desired, be conducted simultaneously with the drying process. This treatment has an advantage in that the addition of extra bulk to the mother liquor stock is obviated; and where the direct ammonia-recovery process is worked, as in coke-oven practice, this point is of considerable importance in keeping down the volume of mother liquor. On theoretical grounds, however, the use of solution appears more rational in ordinary work, in order to ensure that the surface of each individual crystal is freed from acid. A liquid washing medium accomplishes this in an immediate and positive manner, whereas by treatment with solid alkali there is always the possibility of local excess or insufficiency causing irregularity, and, further, the bulk reaction is not completed until after the lapse of considerable time—indeed, often occurring in the bags after packing. Another point of importance in solution treatment is the economy in reagent, for, owing to the simultaneous washing effect, only a small equivalent is actually necessary as compared with the free acid content of the material treated. It thus appears that the solution method requires less control in working, but it must be borne in mind that a repeated draining (or prolonged whizzing) is rendered necessary.

In working with solids, the powders of ammonium or sodium carbonate, or calcium hydrate, are used, and it is necessary to employ quantities equivalent to the whole of the free acid present. In this way, when reagents other than ammonium carbonate are used, the impurity or diluent added may amount at times to 0·5 p.ct. or more—that is, about 50 p.ct. greater than the original free acidity which it was intended to remove. If solid material is to be used, carbonate of ammonia is the most suitable, though perhaps the most expensive. Evidence indicates that the addition of solid alkali liberates local excesses of ammonia in gaseous form, which gradually diffuses throughout the bulk of the sulphate, and eliminates acidity. When working with solutions, hydrates or carbonates of ammonia or soda may be employed; and there is a definite advantage in ammonium hydrate solution in that it can readily be produced on the same plant, thus rendering unnecessary the purchase of alkalies from an outside source, and preventing contamination of the sulphate by impurities. A criticism is sometimes made that the size of the crystals may be reduced by this washing process; but it is found in practice that such action is negligible, and, of course, can be entirely obviated by using mother liquor in making up the alkaline washing liquid.

The Drying Operation.

In drying any non-volatile material the free access of hot air and its constant removal and replacement are essential for quick operation; and in drying sulphate this factor is found to be particularly important. Among the methods adopted is one in which the sensible heat of the damp sulphate is utilized, and the drying occurs as the material is allowed to fall down from a height through the air. The degree of drying depends upon the time of fall, and the temperature, state of division, and moisture content of the salt, upon the temperature and humidity of the atmosphere, and the general ventilation. As some of these factors are subject to wide and uncontrollable variation, preference is often given to enclosed machines, where definite conditions may be produced for drying the material. In such machines heat is applied by steam or direct heating, or by means of a current of hot air entering the drier. The system of counter-current should always be employed, so that the incoming dry air meets the outgoing dry sulphate and leaves the machine at the point where the wet material enters. Not only does this ensure more satisfactory drying, but it solves the troublesome dust problem, since any dust carried away from the dry part of the machine is deposited again by contact with wet material entering. Plants of this type, both horizontal and vertical, are now on the market. One of the latter machines consists of a number of steam-heated trays. A vertical shaft carries arms which rotate in each section, and thus the wet salt is gradually raked down through the sections until it finally emerges perfectly dry at the bottom. The speed, regulated to maintain continuous discharge of dry sulphate, is reduced when dealing with ingoing material containing more than the normal moisture, thus giving it a longer period in the machine. With horizontal types these may be steam jacketted outside and fitted with a horizontal stirring device, or the heating and stirring arrangement may be combined in an internal and rotating set of steam tubes and scraping plates. With this type continuous discharge of none but perfectly dry and regular product is ensured by means of a simple grid. The use of steam for heating driers is very convenient and clean, and is easily controlled by means of steam traps; but the consumption of steam may become rather extravagant if not watched. As regards gas or coke heating, there should be ample scope for the latter owing to its cheapness and the fact that the products of combustion may be used direct to heat the salt and carry away the moisture. A great danger to be guarded against is the possibility of overheating the sulphate, and so causing partial decomposition, eventually resulting in a reversion to acidity. In this condition trouble may be experienced owing to such acid salt becoming baked upon the iron plates or fittings, preventing the flow of heat, and clogging the internal mechanism. In this connection it would not appear a difficult matter to fit an automatic damper on fuel-heated driers, and so prevent excessive temperatures being reached. As has already been stated, the mechanical drier may be used simultaneously as a neutralizing vessel, in which case the solid alkali reagent is added in correct proportion along with the moist sulphate. An alternative is to pass a slight current of ammonia gas through the drier, but in this case the possibilities of loss militate considerably against the process. A most useful phenomenon which has come within the writer's experience in drying neutral sulphate by a steam-heated machine is the rapid decolorizing effect of the heat and air upon salt of blue or black colour. Exactly what this is due to is not clear, but doubtless oxidation is the main reaction, as the decolorizing proceeds in the same way, though very slowly, on air drying in

the cold. It seems surprising that more has not been heard of this phenomenon, which does not appear to have received previous comment.

One of the important advantages of machine driers lies in their adaptability for direct bagging. This is a considerable source of economy, and, moreover, permits the output of a plant to be under constant observation. The size of drying plant required depends upon the weight and moisture content of the salt to be dealt with. Owing to the tendency of wet sulphate to clog, efficient mechanical handling is a difficult matter to ensure, and great pains have been taken adequately to solve the problem. Many driers will not satisfactorily deal with a salt containing more than (say) 4 p.ct. of moisture, and consequently the use of a whizzer is generally essential. There is, however, at least one machine which will satisfactorily deal with products containing up to 10 p.ct. of moisture; and where such a plant is installed there is no need to employ a centrifugal machine in the process, since salt may be transferred direct from a draining table to the drier. It will be readily realized that drying operations are greatly facilitated by large grain crystals, which not only retain less moisture, but open out better when stirred in the drier. The tendency to clog is much reduced, and the formation of objectionable fine dust of a "floury" nature avoided. The main cure for troubles of this kind lies in saturator control.

[In the second part of this paper, which will appear in a subsequent issue, practical considerations will be dealt with and working data given.]

SULPHATE OF AMMONIA DRYING.

A sulphate-drying machine which has recently been installed at several gas-works and collieries has met with marked success. This drier, which is manufactured by the Chemical Engineering and Wilton's Patent Furnace Company, Ltd., of No. 76, Victoria Street, S.W. 1, is the result of long experiment to obtain a drying plant to suit all conditions, and be reliable, self-acting in operation, efficient in energy consumption, of low capital cost, and with no tendency to fracture crystals.

Reliability.

Only experience can produce reliability; and this the firm definitely say has been obtained. Machines running continuously, practically for years, and under the worst possible conditions—namely, drying sulphate direct from the draining table—have proved this point. As the drier runs at only 15 r.p.m., the wear and tear on moving parts is reduced to a minimum. The machine has a specially constructed feed hopper added to it when drying sulphate direct from the draining table. This, however, is unnecessary when drying salt which has been previously whizzed. The salt is placed in the hopper either by an elevator, conveyor, or by gravitation. In the small plants it can be handled by labour. The salt falls through a nest of steam tubes, on the outer circumference of which are fitted shovels slightly inclined in order to give the salt a forward movement as it is picked up and dropped. It leaves the shovels when it reaches the highest point of rotation, and falls again through the steam tubes each time it is slowly moved towards the outlet point—being steadily dried all the time. It is checked at the outlet point by a perforated cover-plate so constructed that, unless the salt is dried to the requisite point, it cannot be ejected as the finished product into the weighing machine or bags, nor can it be ejected in lumps. Thus the whole operation is self acting.

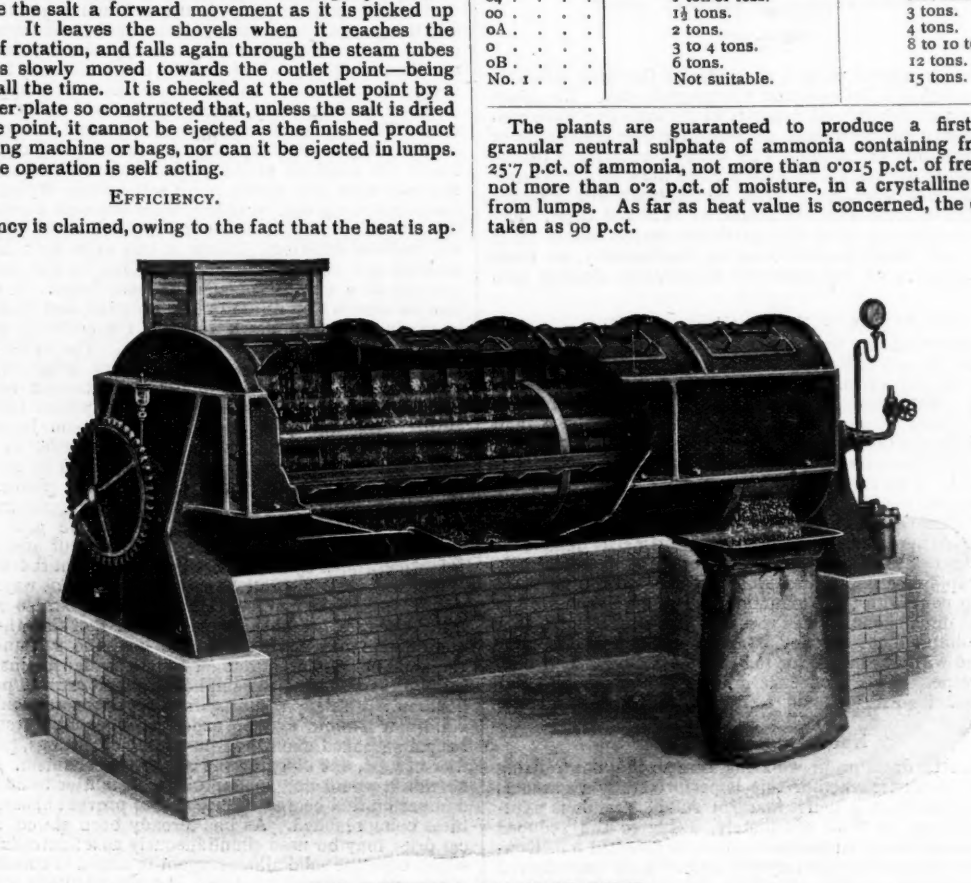
Efficiency.

Great efficiency is claimed, owing to the fact that the heat is applied in the centre of the mass of wet salt, and must radiate through it before a loss of even 1 p.ct. is made in the heat units; whereas, if the heat were applied from a steam jacket, it would start with a loss from radiation on the outer surface. The steam is maintained at a pressure of from 50 to 100 lbs. per sq. in., and is checked at the outlet by a trap; and not until 90 p.ct. of the total heat units in the steam is given up can this be passed on through the steam-trap outlet as water. All moving parts are carefully constructed, and trued-up in expensive machinery and are mounted between bearings of best possible workmanship, giving the most reliable and efficient machine as regards design. Finally, careful microscopical inspection of the crystals before and after treatment in the drier shows that they are ejected practically unbroken, thus reducing the possibilities of a dusty salt when dried. Should the alkali or neutralizing agent have been imperfectly applied before the salt reaches the drier, the fact that it is dried without a current of hot air renders it possible for the alkali present in the confined space of a continuous shower of sulphate finally and completely to neutralize any salt not perfectly treated in the first case.

These machines are made in a number of sizes, as tabulated below:

Size.	Output Straight from Draining Table.	Output when Used After a Centrifugal Machine.
04	1 ton or less.	Not suitable.
00	1½ tons.	3 tons.
0A	2 tons.	4 tons.
0	3 to 4 tons.	8 to 10 tons.
0B	6 tons.	12 tons.
No. 1 . . .	Not suitable.	15 tons.

The plants are guaranteed to produce a first-grade dry granular neutral sulphate of ammonia containing from 25·5 to 25·7 p.ct. of ammonia, not more than 0·015 p.ct. of free acid, and not more than 0·2 p.ct. of moisture, in a crystalline state free from lumps. As far as heat value is concerned, the efficiency is taken as 90 p.ct.



THE "WILTON" SULPHATE DRIER.

London and Southern District Junior Gas Association.—At a meeting on Friday, April 25, at 7.30, in the Westminster Technical Institute, a "bioscope talk" on "The Mechanical Handling of Materials" will be given by Mr. F. H. F. Hampton, a member of the American Institute of Mining and Metallurgical Engineers. Owing to urgent business abroad, Mr. R. K. Stockwell, British Engineering Manager of the Robins Conveying Belt Company, will be unable to be present, but he has very kindly arranged for Mr. Hampton to give this talk in his stead, and there is every promise of a thoroughly enjoyable evening.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

SPRING MEETING IN GLASGOW.

The Spring Meeting of the Association was held in Glasgow on Friday last, and took the form in the early part of the day of a visit of inspection to the Provan Gas-Works of the Corporation. Upwards of 200 members and friends availed themselves of the invitation generously extended by the Gas Department to inspect the Woodall-Duckham installation of vertical retorts, which is one of the outstanding features of the plant at Provan. A complete tour of inspection was made of the works, and subsequently the company returned to the Grand Hotel, Charing Cross, Glasgow, where luncheon was partaken of.

Luncheon.

Mr. J. W. M'Lusky (of Glasgow), the President, took the chair at the luncheon, and was supported at the head of the table by a company representative of gas manufacturing undertakings both in city and country, as well as many firms prominent in the realm of gas engineering.

Sir Arthur Duckham, in proposing the toast of "The North British Association of Gas Managers," made special reference to their valuable work on behalf of the industry. His contention was that they represented the paramount industry of the country, as the production of gas must in time become the basis of all industry dependent on the supply of fuel and power. It seemed to him that at present the uninitiated "man in the street" was inclined to subscribe to the belief that electricity was the be-all and end-all of everything; but this was disproved by the great increase in the use of gas. Their industry, however, was only as yet in its childhood. Gas, even at its present price, could be used to reduce costs; and they wanted to get a fuller appreciation of this fact into the minds of those who controlled industry. In course of time they would have to be able to supply the fuel of the country, and that was a fundamental point. He had been associated with the industry for more than twenty years now, and when he made some investigations recently he had been astounded to find to what degree gas, even at its present stage, could be used to reduce industrial costs. Every member of Parliament and every town councillor, he declared, should be made to pass an examination in the use of gas in industry. As regards the improvement in the cleanliness of British cities, he attributed it solely to the greater use of gas.

The President, with whose name the toast was coupled, referred to the great progress which had been made by gas in recent years, and remarked that sufficient proof of this was to be found in the fact that they could not meet the demand for appliances. Regarding the educational aspect of the Association's work, he urged the great need for studying the best methods of producing men who in the future would lift the industry out of the ordinary rut, and establish it still more on a scientific basis. They wanted to see before many years, not only a diploma for gas engineers, but also a degree. At the present time, in point of actual fact, the Council of the Association were very hopeful of being ultimately able to formulate a scheme which would be the means of producing a class of men who would rank high in public estimation. Besides studying processes of recovering bye-products and engineering problems, they were constantly confronted by keen competition. As an illustration of this, he stated that last year the Provan Gas-Works obtained their electricity for 0·6d. per unit. He did not know what fuel costs were in the Electricity Department, but he was sure they were greater than was represented by this figure. Frankly, he would like to know how anyone could establish a case for selling it at a cost less than that of the fuel. He did not complain, however; it was not his business to ask how it was done. But when it came to housing schemes, he objected to the Electricity Department offering to fit up houses free. To his mind, this was not fair competition, inasmuch as it was done with public money. In the Gas Department, they wanted a certain price, because they felt a measure of responsibility in regard to the money of the consumers. Of course, the Electricity Department were handling the money of electricity consumers, and he supposed it would be for the Corporation to say what was fair and equitable finance.

The toast of "The Visitors" was proposed by Mr. James Campbell (Dunfermline), the Vice-President of the Association, and acknowledged by Mr. W. B. M'Lusky (Halifax). The latter gentleman spoke in reminiscent vein, and touched upon his earlier connections with the Waverley and North British Associations.

Ex-Bailie Renfrew (Convener of the Gas Committee), replying to the toast of "The Glasgow Corporation Gas Department and Committee," said that for eight years they had been obliged to face deficits; but last year, happily, they had been favoured with an exceptionally large output, and had made a profit of £300,000. In Mr. J. W. M'Lusky (their Manager), and in Mr. W. W. Stones and the other Chief Assistants, they had an excellent staff. He thanked the proposer of the toast (Mr. John Wilson, of Motherwell) for kind references to the City Gas Department and to the Convener of the Gas Committee.

Mr. W. M. Mason, Manager of the British Commercial Gas Association (called upon by the President), explained the progress which was being made at Wembley to display the uses and advantages of gas. He urged that full advantage should be taken of the magnificent opportunity which the exhibition afforded of proclaiming the merits of gas.

BUSINESS MEETING.

At the business meeting which followed immediately after the luncheon, the following paper was read:

NOTES ON A SPIRAL-GUIDED HOLDER AND FERRO-CONCRETE TANK.

By Laurence R. Hislop, of Dundee.

Before proceeding to describe the spiral-guided holder of 2¼ million c.ft. capacity, and the ferro-concrete tank erected as part thereof, in Dundee, permit me first to mention one of the unsatisfactory conditions under which we had been working prior to the erection of this holder. During the heavy winter load, and particularly at the New Year holidays, our daily output has been about 7 million c.ft. per day, while our full storage capacity was barely 2 million c.ft.—a condition which, you will agree, was not at all satisfactory. The extension of the area of supply from 19¾ to 22 sq. miles, and the ever-increasing demand for gas by all classes of the community, made immediate consideration of additional storage capacity a matter of vital importance.

The construction of a new holder being decided upon, ground was purchased at a short distance from the works sufficient for the erection of two holders, each of a capacity of 2¼ million c.ft. The amount of excavation work required was then considered in detail, this being necessary for the procuring of data relative to the position and dimensions of the tank and holder. The usual borings were taken, and it was found that, owing to the rock base of the site, excavation would not exceed 22 ft. in depth. Calculating on this basis, it was ascertained that the tank would require to be 172 ft. 6 in. inside diameter by 32 ft. deep to the top of the rest stones, and the top, or platform, of the tank 15 ft. above ground level. The foregoing data being fixed, the materials for the tank construction next claimed our attention. Due consideration was first of all given to the adoption of iron or steel; but local conditions—such as the continual flooding of the site with tidal water to within 3 ft. of the ground line, and the fact that the tank would be above ground—debarred the selection of this type. The question of a ferro-concrete tank was then considered. Advantages and disadvantages were fully discussed, with the result that this form of tank was finally decided upon. Preliminary general design drawings were sent out, tenders for the work procured, the most favourable was accepted, and the work was commenced.

The excavation work was carried out expeditiously by a Dundee contractor. Pockets in the rock formation caused a good deal of delay and trouble, one absorbing sixty tons of concrete before being brought up to the required level. After the site was levelled off, other pockets suddenly appeared, due to loose rock sinking on to the firm rock bed underneath. At low tide these had to be levelled-up again, this operation taking a further seventy tons of concrete. These and other difficulties were eventually overcome, and the tank built upon a solid foundation. The tenders for the tank construction were remarkable for the great difference of design. In these the section of the tank walls at the thinnest point varied from 4½ in. to 14 in., and the section of the walls at the thickest (or underground) portion varied from 14 in. to 2 ft. 6 in. Those showing the smaller dimensions were at once discarded as unsuitable, and a tender embodying one of the heavier sections accepted. Criticism of our action in adopting a ferro-concrete tank was not wanting, but no attention was paid thereto, and the work proceeded.

The tenders for the holder were asked and received from firms of repute. These were carefully considered from all points, the accepted one embodying the latest improvements in gasholder construction. The holder is in an exposed position open to heavy weather from the North Sea, and every care was taken to see that the structure offered ensured absolute safety. The holder site was previously occupied with an old warehouse, stabling, and various other old buildings. After these had been demolished and removed, the excavation for the tank was commenced by Mr. David Horsburgh, of Dundee. The depth from the ground level to the underside of the tank was about 22 ft. Red whinstone was encountered at depths varying from 4 ft. to 20 ft., and blasting was necessary for its removal. Excavated material was loaded into tipping skips, which were hoisted by a crane, and emptied into carts or railway wagons for disposal; a siding being extended from the railway mineral yard adjoining the site of the new work to facilitate operations.

The method of arriving at the design required is as follows: The three lifts of the holder are constructed in steel, and operate on the spiral-guided principle in what is believed to be the largest ferro-concrete tank in the British Isles. The tank, of which fig. 1 is a photograph, was designed and erected by Messrs. K. Holst & Co., of London, and a part-section through its diameter is given in fig. 2. The usual cone is provided in the centre. The internal diameter is 172 ft. 6 in., and the depth at the outside wall 35 ft. 6 in., the latter figure giving the water pressure to be withstood. The thickness of the wall is 2 ft. 3 in. from the base to ground level, above which it tapers to 1 ft. 2 in. at the underside of the beam or tank platform, which, being heavily reinforced, acts as a band support to the top of the wall, and incidentally provides a walking-way fitted with a iron hand-rail round the outside. Anti-freezing apparatus is carried on each of two ferro-

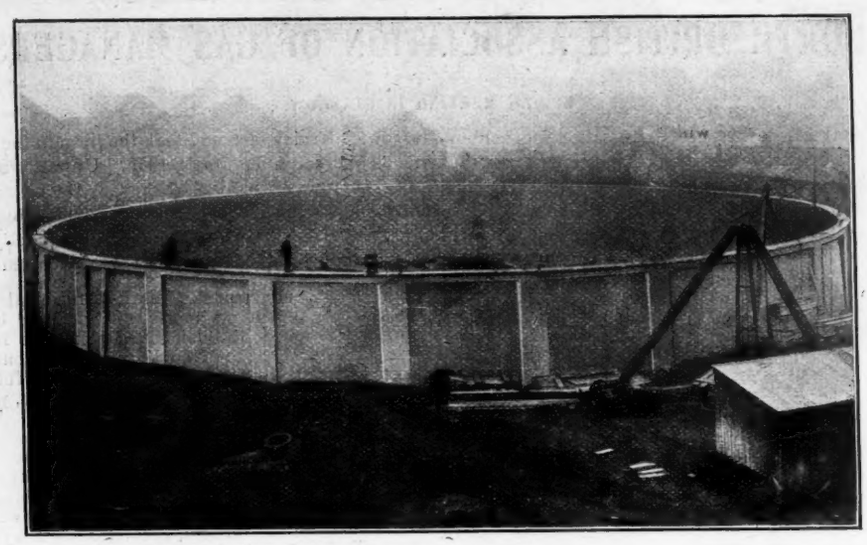


FIG. 1.—THE COMPLETED TANK.

concrete platforms cantilevered from the beam at the top. Separate pipe boxes, each D shaped in plan, and 27 ft. deep below ground level, are provided for the accommodation of the inlet and outlet mains, which consist of 30-in. diameter cast-iron pipes. To avoid any chance of leakage from the tank into the pipe boxes, the lengths which had to be built into the tank wall were fitted with puddle flanges, as shown in fig. 3. The carriages supporting the gasholder are mounted on 28 ferro-concrete piers spaced equally round and forming part of the outside wall.

The tank was designed as a monolithic structure to resist internal water pressure accompanied by outside earth pressure, and outside earth pressure when the tank is empty; due regard being paid in the latter case to the fact that during high tides the water in the ground rises to a high level. The forces in the first case are, of course, much greater than those in the second; but for a ferro-concrete structure both conditions have to be carefully considered in order to determine the correct reinforcement to each side of the wall. A 35 ft. 6 in. head of water produces a pressure of 2180 lbs. per sq. ft. at the bottom of the tank, and a total bursting force of approximately 3000 tons. Part of this force is withstood by circumferential tension, and part by the bending of the vertical units of the wall between the base and the radial support afforded by the encircling beam at the top. It should be noticed here that the water pressure on the base holds the bottom of the wall in a vertical position, and prevents any tilting action. The vertical units are therefore subjected to bending as beams fixed at the bottom and simply supported at the top. It should also be borne in mind that the top support is not rigid, the circumferential extension of the beam with the application of load causing an appreciable radial deflection. The problem of discovering what part of the load would be withstood by ring tension and what by vertical bending was one of trial and error. A distribution was assumed accordingly, and radial deflections of the wall calculated for each of the two systems. This process was repeated until the deflections for each system were the same throughout the height of the wall, when obviously the correct distribution had been obtained. This having been done, the bending moments and forces to be withstood were found in the usual way. Stresses in concrete and steel were limited to 600 lbs. per sq. in. (compression only) and 16,000 lbs. per sq. in. (compression or tension) respectively. Sufficient circumferential steel was placed to resist all ring tension at the stress given above. Nevertheless it must be realized that the concrete is bound to be subjected to tensile stress; and, to avoid cracks, the thickness of the wall was decided so that this tensile stress should in no case exceed 180 lbs. per sq. in. The high level of the ground water has a considerable effect upon the forces to be resisted by a centre cone, which sustains both the pressure from the water in the tank, and the bulging action of the water in the ground when the tank is empty.

For the provision of a thoroughly water-tight structure it was essential that the materials and workmanship should be of first quality, and that the aggregate and sand for the concrete should be well graded. Cement rendering was avoided on account of the risk of its cracking and scaling-off owing to expansion and contraction of the tank. The aim was to make the concrete of such a mixture as to be impervious to water in itself; and, as an extra safeguard, the inside of the tank was coated with a waterproofing material. No cement or steel was accepted for the work until, on being tested by experts, it was found to comply with British Standard Specification. The concrete was mixed in the proportion by volume of 1 of cement to 2 of clean Tay sand to 4 of crushed whinstone screened to pass a 1¼-in., but to be retained on a ¼-in., mesh. Reinforcement consists of mild-steel round bars securely wired together to form a complete framework.

For the purpose of construction the tank was divided up into seven sectors, each of which measured approximately 80 ft. along the outside wall. As soon as excavation was sufficiently advanced, reinforcement to the base of the first sector was laid, and the slab concreted. It will be seen in fig. 2 that the base reinforcement extends into the vertical walls, and also into the surface of the cone, this being necessary for the formation of a monolithic structure. The next operation was to place the reinforcement and centering to the face of the cone, which was then concreted; while this was being done, reinforcement, centering, scaffolding, and concreting (with a second concrete mixer) to the outside vertical wall were proceeded with. Before the cone face of

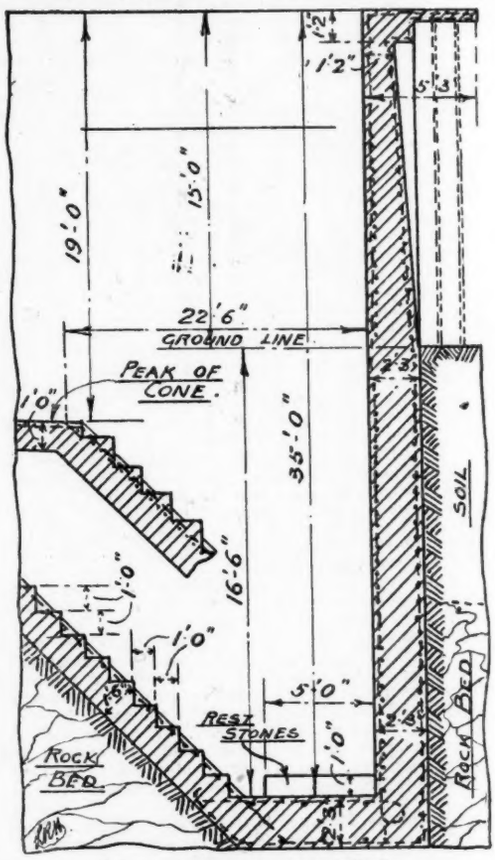


Fig. 2.—Section through Tank Walls.

sector I. was completed, steel was laid in the base of sector II., the object being that concreting with each mixer might continue without interruption. The procedure may be more clearly explained by describing simultaneous operations on three sectors (say, Nos. III., IV., and V.) when work was in full swing.

Sector III.—Placing of reinforcement, moving of shutters, and concreting with No. 1 mixer to outside vertical wall above height of 4 ft.

Sector IV.—Concreting to base, placing of steel, fixing of shutters, and concreting to outside wall up to a height of 4 ft.—all of this concreting being done with No. 2 mixer.

Sector V.—Placing of steel to base.

Both mixers were mounted on rails near the top edge of the centre cone, so that they might be moved easily to their required positions. Concrete for the outside walls above 4 ft. was transferred straight from No. 1 mixer by means of a chute into a storage hopper standing in the base along by the side of an Insley mast-hoisting plant, the hoist bucket of which was fed straight from the hopper, lifted to the required height by means of an electrically-driven winch, and automatically emptied into chutes which conveyed the concrete by gravity to wherever it was required. The concrete for the base wall up to 4 ft., and for the face of the cone was taken through chutes straight from the mixer to the position required. "Blaw" light steel forms were used for centering, with the result that a very smooth and even surface to the concrete was obtained. Fig. 3a shows these forms in use. To ensure a water-tight connection between any two sectors, iron sheets 2 ft. 6 in. wide were inserted for the full height and in the centre of the wall, with their centre lines on each joint. Fig. 3b shows these plates at the vertical termination of the concrete, and fig. 3c shows a portion of the tank reinforcement. The last portion of the work to be carried out was the cone floor. This also was in reinforced concrete, and was laid on a well-rammed hard cone filling 9 in. thick. The king-post rest block is laid 6 ft. square by 15 ft. deep, and is of solid concrete.

A large amount of water was encountered during construction, and to deal with it satisfactorily an electrically-driven centri-

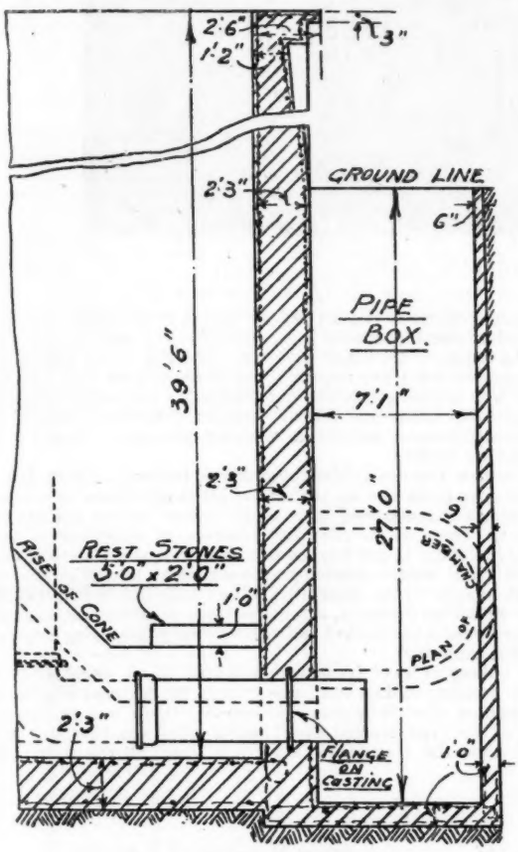


Fig. 3.—Section through Pipe Box.

fugal pump had to be kept running continuously. During construction, under a portion of the tank vertical wall, an old quarry was encountered, which had been filled in with soft soil. This had to be excavated and replaced by mass concrete up to the underside of the trench slab, in order to provide a sound foundation. About three months after completion and filling of the tank with water, sweating began to appear on the outer surface at various points. The matter was brought up at one of our Committee meetings, and information was asked as to whether there would be rusting of the reinforcing metal. This was, as you will at once appreciate, a question which could only be put by one having no experience of ferro-concrete work. No oxidation can possibly occur. The efflorescence appearing occurs in all ferro-concrete tank work, and is due to the formation of sulphate of calcium, magnesium, &c., as well as an excess of free lime in the cement. The time given for this efflorescence to continue is from 9 months to 2 years, after which it will disappear. Scrubbing with wire brushes to improve the appearance of the outer surface is sometimes resorted to. This removes the deposit; but the surface is much better left alone. The tank is now water-tight and thoroughly satisfactory in every way. In a week's test, with gas in the holder, no leakage whatever was found. So much for the ferro-concrete tank.

The spiral-guided holder was invented in the year 1888. The

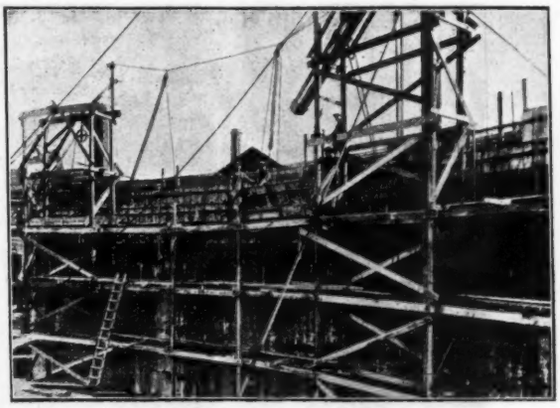


Fig 3a.—Shuttering of Tank.

first was erected at Northwich—a town of unenviable repute, owing to subsidences. The late Mr. S. Mellor, then Engineer, must have had great faith in the spiral principle, as he recommended its adoption very strongly. At that time it was necessary, every year, to re-plumb the framing on his existing frame-guided holders. He lived long enough to prove that his views were correct, for he erected two other spiral holders with steel tanks on his works, and pulled down his frame-guided holders altogether. Many discussions and much piquant correspondence was evident in the early nineties, and in the Technical Press recognized authorities were free in their condemnation; but the spiral guided holder, having passed through that period of opposition so often associated with new ideas, has proved itself beyond all doubt safe and economical. Indeed, when we consider the prevailing high prices for labour and material, and the need to reduce capital charges wherever possible, we at once come to the conclusion that no progressive gas engineer will, at the present day, consider any other type of holder. Every engineer recognizes the action of the screw and nut, and a spiral guided holder is this principle carried into practice. It embraces among others the following advantages as compared with the frame type:

1. No external frame to provide in the first instance.
2. No charges for paint and labour on the framework.
3. Less time required for manufacture and erection.
4. Less labour at makers' works and in erection of the site.
5. Tank construction simplified, whether in steel, brick, or ferro-concrete.
6. Less material conveyed from makers' works to site, and carriage and freight thereby greatly reduced.
7. Tank construction improved.

In steel tanks the tank carriages are secured to the sides of the tank by brackets, while in brick tanks the massive column piers, which are expensive, and interfere with the bonding and general circumferential stability of the tank, are dispensed with. In the Dundee holder the piers do not exceed the thickness of the lower tank wall, being 3 ft. 6 in. by 2 ft. 3 in. in section. The carriages are secured by anchor bolts and flat strap bolts on the inner surface of the tank—four to each carriage. This arrangement is shown in fig. 4.

Whether the holder is in or out of action, the framing of a column guided gasholder is always visible, whereas in a spiral it is only seen to its inflated height, and in summer time it need not be utilized to its fullest capacity, which fact (in our case, at least) is a great advantage. Owing to its screw action, if erected in true alignment, it must necessarily work steadily, for it cannot move more than half-an-inch before the control rollers grip the guide rails. In rough weather we often find our frame-guided holders moving 5 in., even when the guide carriages are in perfect order, and instances are recorded when this movement has affected the working of station governors. Such a thing is impossible with the spiral-guided type. It follows, therefore, that if a spiral cannot get out of level, it will not be affected by snowdrifts, which have often wrecked holders of the framed type. Much thought has been given to the improvements on this type of holder, and one firm alone have been granted sixteen patents for these. We can at once realize their advantage when we remember that originally all the carriages were inside, and impossible either to see or to adjust. The guides were made of small-joist iron secured to the sheeting, and the outward appearance was disfigured and attacked by crown drainings, while no provision was made for expansion during hot weather causing holders to jamb and loose the normal pressure. The fact that spiral-guided holders are operating in Norway and Canada, where heavy snowfalls occur, and in China and South America, where high temperatures are recorded, speaks most favourably for their efficiency under all weather conditions.

The storage of gas to-day does not require the capital outlay that obtained a decade ago, for we have to a very great extent removed our peak load, and a water-gas plant is always at hand to meet emergencies. To-day we find these conditions admit of our removing old storage vessels, and constructing in existing tanks holders of the spiral type having additional lifts. In one

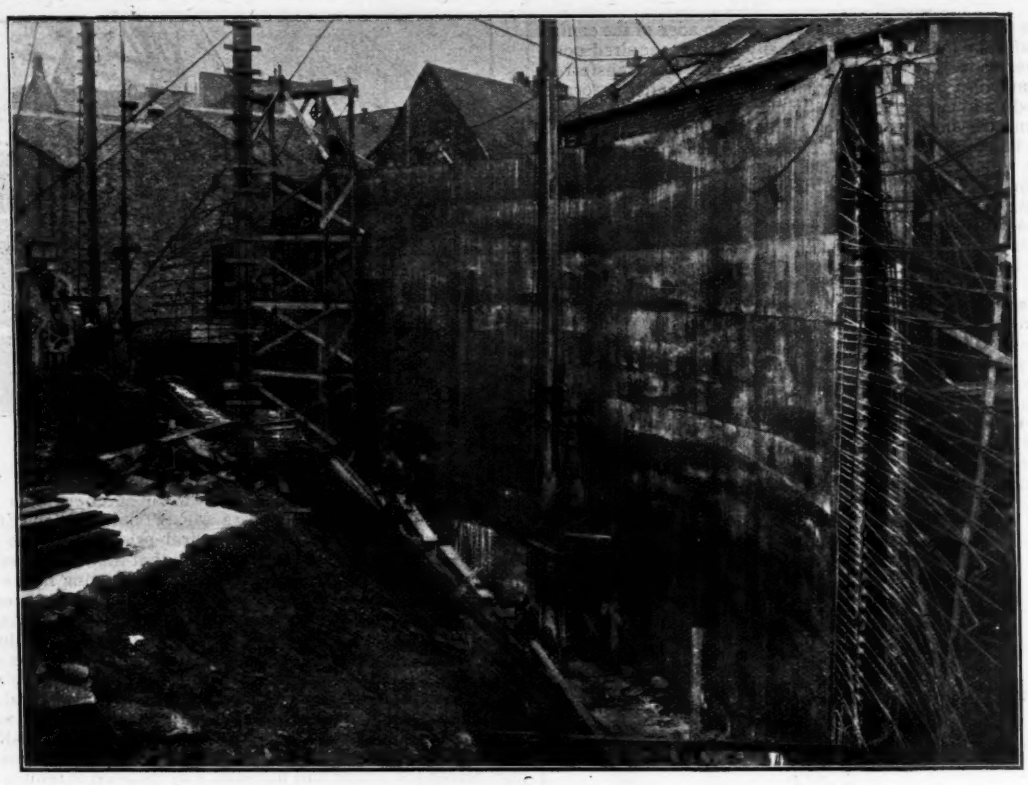


FIG. 3b.—REINFORCED CONCRETE TANK WORK.

Fig. 3c.—Another View of Tank Reinforcement.

instance (Bolton) a two-lift holder of 150 ft. diameter was dismantled, the tank deepened 4 ft., and a four-lift erected, increasing the capacity by about 120 p.ct. In such cases additional holding-down bolts are required, but these can be fixed without in any way breaking into the old tank walls and without risk of leakage. We often find framed holders which had been built with counterbalance weights to minimize pressure. To-day it is pressure we require.

In our new Dundee holder the crown is trussed, and the inner lift therefore gives us 8 in., the second lift cupped gives 10 in., and third lift 12 in. pressure. The holder crown trusses are shown in fig. 5. There is no difficulty, however, in weighting an untrussed gasholder to give any required pressure, and I know of one four-lift spiral holder, erected on the sea coast, having 40 tons of weights secured to the inner lift. When fully inflated its height almost equals its diameter, and under these severe conditions and weather stress it has worked satisfactorily for years, being emptied and filled each day.

The upkeep of steel framework exposed to all weathers is a serious problem to-day, and I do not envy the engineer who has a large number of such holders. In one city there is a 10-million holder of this type, erected about twelve years ago, that has employed upon the framework a gang of men all the year, the

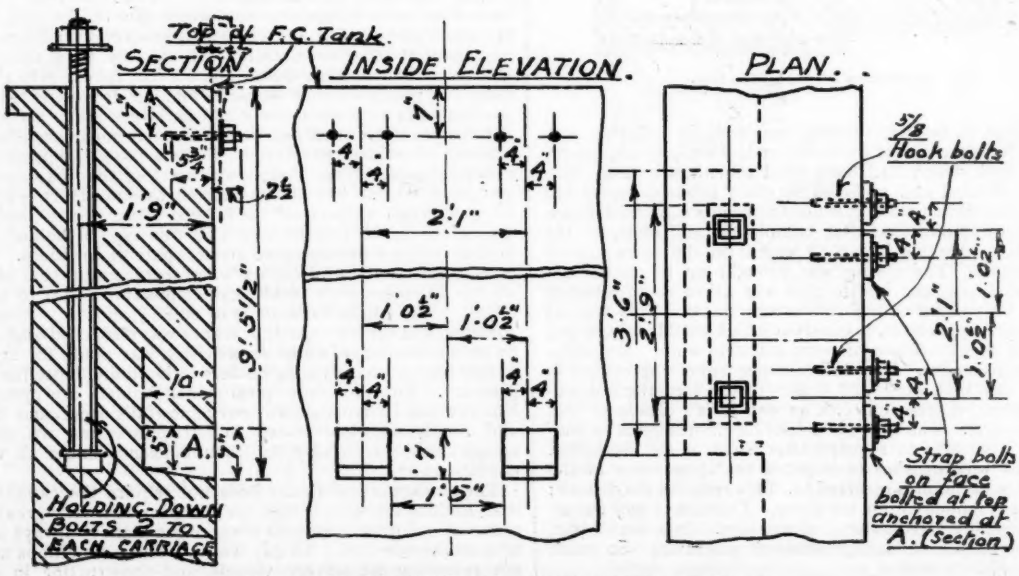


FIG. 4.—ARRANGEMENT OF HOLDING-DOWN BOLTS, &c.

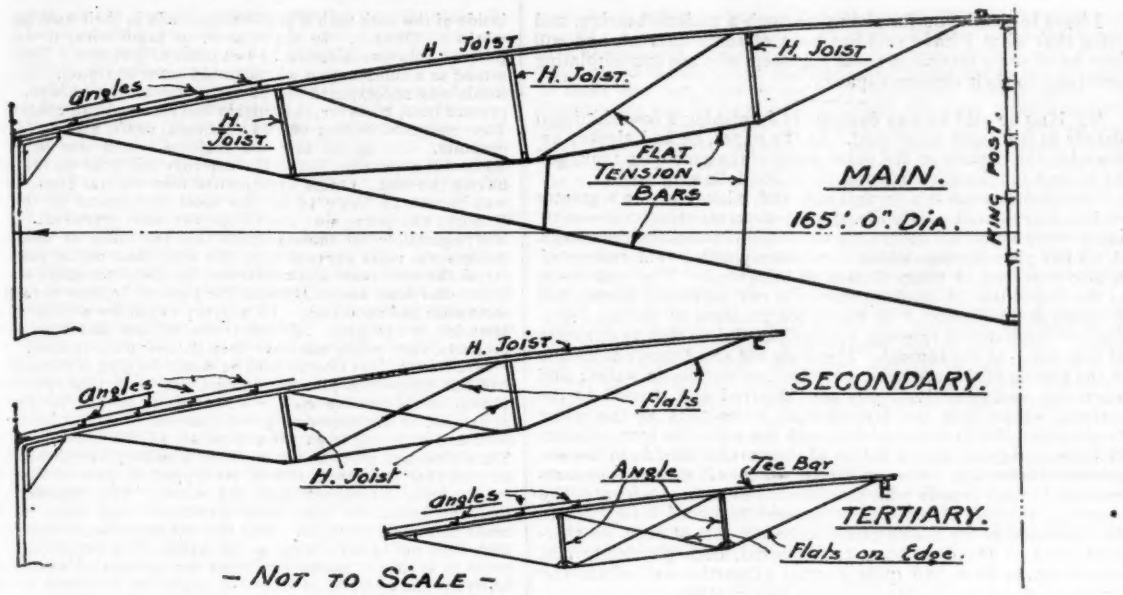


FIG. 5.—ARRANGEMENT OF HOLDER CROWN TRUSSES.

cost amounting to not less than £1500 for labour and material at prevailing rates. When we have such instances, what justification have we, as engineers, to saddle ourselves and our successors with annual charges that can be avoided? An excellent example has been set us by the two past Presidents of the Institution of Gas Engineers, in erecting holders without external framework.

In Dundee the strain on each of the tank carriages (due to a wind pressure of 40 lbs. per sq. ft. of flat vertical surface, when the holder is fully inflated) is six tons; and if the wind pressure is considered as exerting a force of 50 lbs. per sq. ft. of flat vertical surface, then the strain is only 7½ tons. The axles on these tank carriages are 3¾ in. in diameter, of best forged steel. Hence, there is a very wide margin of safety. When the wind strikes the holder the two lower rollers on the windward-side carriages grip the rails, and the two upper rollers on the lee side; hence we have a bearing at 52 points on the guide rails. This fact should not be overlooked. The contact points are far more than the bearing points on the frame type of holder. Further, these carriages and rails must be set true, and therefore operative, which can seldom be said of our other storage vessels. I have often seen pulleys clear of the sides of their guides, let alone gearing with the path of same.

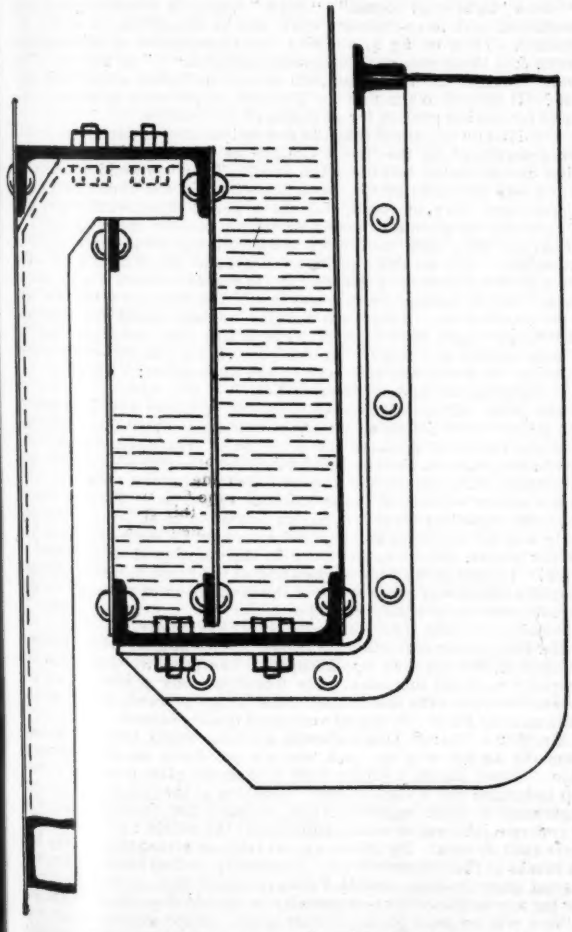


Fig. 6.—Method of Supporting Cups and Dips.

In constructing a holder having more than two lifts, provision must be made in the carriages to take care of expansion. The tank is a fixture, but the lifts will expand appreciably in hot weather. The lower lifts might jamb, and permit the inside or upper lifts running down and unsealing. We have provided stops to meet this emergency, and have sliding axles on the carriages that make such a thing impossible. It will be seen from the drawing showing the sheeting of the gasholder how very much stronger the shell is owing to the vertical stays, rail plates, and rails. These really form a long deep girder, if the sheeting is discarded. The vertical stays are kneed at the upper ends to ensure the dip channels are maintained level, and are secured to the dip and cup channels, also to the rails and rail plates at their intersections. The guide rails are riveted to the ⅜-in. rail plate, and the latter to the sheeting, and these materially help to maintain the shell in true circular form. The extended sheet is a guard against the water of the cup being displaced by high winds, and, in addition, prevents the deposits on the crown being washed down the side sheeting of the holder. The bracket bars carrying the crown sheets are not cut and secured between the main, secondary, and tertiary bars, but made continuous, and secured to the upper side of the roof rafters. This method provides a true sphere segment and a continuous contact support for the sheeting. These bars are rapidly fixed, and no manufacturing labour is required other than holing and sweeping, all welding and turning of ends is avoided, and all the roof bars secured in their true radial line. Flats have been used on the Dundee holder to form the bowstrings of rafters and main tension ties, while the struts are of H joist iron. The vertical stays for the two outer lifts are of channel iron, and for the inner lift plate girders. (Shown in figs. 5 and 6.) I have already referred to the dip channels being maintained level. This is essential if the rollers on the dip carriages are to work true along the spiral rails; and where this has been neglected the rails have worn unevenly and the carriage axles show unequal wear.

The principal dimensions of the Dundee tank and holder are as follows:

Ferro-concrete tank—

(1) 172 ft. 6 in. inside diameter.
(2) Extreme depth of tank below ground line, 28 ft.
(3) Tank above ground line, 15 ft.

Holder—

(1) Capacity 2¼ million c.ft.
(2) Three lifts, 170 ft., 167 ft. 6 in., and 165 ft. diameter.
(3) Each lift 32 ft. deep.

The period taken in the construction (taken from the breaking of the ground to the date of completion) is as follows:

Excavations begun	March 31, 1921	
do. completed	Sept. 12, 1921	
		5½ months
Tank begun	Sept. 12, 1921	
do. completed	Dec. 21, 1922	
		1 year and 3½ months
Holder begun	Jan. 8, 1923	
do. completed	Sept. 10, 1923	
		8 months
		Total = 2 years and 5 months

I have to thank you for giving me such a patient hearing, and trust that what I have said has been of some interest, and will also be of some service to those engineers who are contemplating additions to their storage capacity.

Mr. Hislop said he was desirous of furnishing a few additional details to the paper as printed. In the paper, he had already referred to the deposit on the outer walls of the gasholder tank, and he wished to incorporate in the paper the following notes.

The phenomenon is a natural one, and takes place to a greater or less degree in the early life of most concrete structures—especially those which are constantly wet, such as tanks and reservoirs. A similar phenomenon, which is commonly called "efflorescence," is also observed in many classes of brickwork. The real cause of the deposition of the incrustation is not positively known, but it seems probable that it is due to the presence of certain ingredients—sulphates of calcium, magnesium, &c., as well as an excess of free lime—in the cement. These are not acted upon chemically in the setting of the concrete, but they are soluble in water; and when the wall is soaked, they are dissolved and carried to the surface, where they are deposited as white salts as the water evaporates—the lime combining with the water to form calcium hydrate, and later, by the action of the carbon dioxide in the air, calcium carbonate. The extent to which efflorescence occurs appears to vary greatly with the different brands of cement. The chemical analysis of the cement appears to afford little guide to the likelihood of its taking place, since the test of each consignment used at Dundee shows the material, both physically and chemically, to have had quite normal properties well within the requirements of the British standard specification.

The deposit is in no way injurious to the steel reinforcement. The rusting of iron consists in the oxidation of the metal to the condition of hydrated oxide. It does not take place even in moist air which is free from carbonic acid; the combined action of moisture and carbonic acid being necessary. By the action of water, cement is converted into a crystalline mass of hydrated calcium silicate and calcium hydrate, and in hardening it rapidly absorbs carbonic acid, becoming coated on the surface with a film of carbonate. The mortar thus efficiently protects the iron, and captures and imprisons every carbonic acid molecule that threatens to attack the metal. The action is not due to the exclusion of air; and even though the concrete were porous, and not in contact with the metal at all points, it would still filter-out and neutralize the acid, thus preventing its corrosive effect. The water will finally dissolve out all the discolouring matter, and will deposit it on the face of the wall.

Rain will gradually dissolve and wash-off the sulphates, but the other salts will probably not disappear naturally. The action is more or less uncertain. The process may be extremely slow, sometimes lasting for years before the discoloration finally disappears. In this case, however, the thickness of the deposit appears to show that the action is taking place rapidly, and a comparatively short period—say, a year or so—may see the completion of the process. The incrustation may be removed by the use of wire brushes or by washing-down the wall with dilute acetic, oxalic, or hydrochloric acid; the wash being applied vigorously with brushes and removed with a hose to prevent penetration of the acid. But such removal might prove only temporary, since, as already stated, there is no assurance that further efflorescence will not take place. The stability of the tank is not in any way affected by the deposit. The incrustation is formed by the solution of non-essential ingredients of the cement which have no action in the setting of the concrete, and their absence will not affect its strength. Every concrete tank of which the outer surface is exposed exhibits efflorescence to a greater or less degree in its early life.

Discussion.

Mr. J. Harper (Ayr) said that during the time he was in Dundee the make of gas was far in excess of the storage capacity. On that account he fully appreciated all Mr. Hislop had said by way of explaining the necessity for the task. He thought the author had omitted one important point, and it would be valuable if the members could have enlightenment upon it. Mr. Hislop might explain the methods he adopted, after the holder was finished, to prevent corrosion and wear and tear by weathering. At this period of the year most gas engineers were concerned with the question of re-painting and repairing their holders, and it would be useful to have guidance from the author, if he could give it. He thought it would be of general interest if Mr. Hislop would state the steps he took to protect the surface of the holder sheets. Was consideration given to any particular paint in the coating of the holder, and could Mr. Hislop venture an opinion as to the number of coatings which ought to be put on? It was well to keep in mind that the building of a holder was one thing, and its maintenance against all sorts of weather conditions—especially on the sea coast—another. Speaking for himself, he had experience of holders on both the east and the west coasts of Scotland, and found that the ravages of weather were more severe on the west coast. From this standpoint, he would like to have Mr. Hislop's opinion as to the method he adopted to prevent corrosion of the holders.

Mr. Hislop explained, in reply, that the holder itself had not been touched since it was put up. Further, the efflorescence he described had already begun to disappear. When this question was raised in the Dundee Town Council, the suggestion thrown out was that probably the material used in the tank had not been of the best. In Dundee—particularly in the Gas Department—they prided themselves on the insistence with which they had held out for material of the very best manufacture. They actually knew that this efflorescence was going to occur. In regard to paint, he ought to explain that they coated the inside of the tank with a preparation made in their own tar distillation works at Dundee. In appearance, to begin with, it was like thick putty. This was followed by two coats of graphite. This was represented as a combination which would resist anything. Of course, the inside was not exposed in the same way as the outside. Up to the present time, however, the outside had received two coats of graphite. They purposed putting on two additional coats, making four in all, of graphite. He agreed that the graphite which was being used was somewhat expensive, but in Dundee they had gone on the principle of having the best. Offers were invited from several firms, and the best was chosen as likely to be the most economical in the long run. Quality, not price, was the thing that most mattered. Mr. Harper was responsible for the statement that the effect of weather on gasholders was more noticeable on the west than on the east coast. So far as the west coast was concerned, he could not speak about it; but in the east coast and in Dundee the present holders were getting into somewhat bad condition. To a great extent he attributed this to inattention in the past. Indeed, if the holders had been looked after properly, they would not have been in their present state.

Mr. David Vass (Perth) said he would be glad if those present who had had experience of constructions similar to that described by Mr. Hislop would give the members the benefit of their knowledge. Just at present he was considering the question of a new holder, and had been endeavouring to gather and collate all the information he could. Some time ago, when he was erecting a holder, the consulting engineer advised that the sheets should be dipped or painted with boiled oil before being dispatched from the works. This engineer's idea was that, the boiled oil being very transparent, any flaws in the sheets could be readily detected. Was this the best plan, or should there not have been put in something in the nature of a preservative paint, in order to keep the holder free from any process of oxidation? As a feeler on this question of paint, he might be permitted to refer to an incident. Once on going into a holder that had been dismantled, he noticed that the only signs of paint to be observed anywhere were marks of white lead put on by the firm in making the sheets. Of course, the natural inference to be drawn from this was that white lead was a better preservative than red oxide or any other preparation they were in the habit of using.

Mr. Hislop, like Mr. Vass, wanted to find out, if he could, the experience of others in regard to white lead paint.

Mr. Alexander Smith (Tradeston, Glasgow) considered the Association were to be congratulated on having this valuable treatise from Mr. Hislop. In the paper he observed this sentence: "Ground was purchased at a short distance from the works sufficient for the erection of two holders, each of a capacity of 2¼ million c.ft." Would the author explain why a holder of larger diameter was not put in? How was the question of an iron or steel tank treated? With regard to fig. 2, the distance from top to bottom was given as 35 ft. In view of this, and the other figure of 32 ft. which had been given in the paper, he would like to know if the tank was full to its capacity; or was the water level kept down 2 or 3 ft. from the dock? He was at a loss to understand the meaning of the reference in the paper to "'Blaw' light steel forms." "Blaw" might be something technical associated with ferro-concrete work, and he should like to have it explained. Then on fig. 4, showing the arrangement of holding-down bolts, &c., there were various openings marked "A" on the face of the wall. Would Mr. Hislop be good enough to explain what these were for? It seemed to him that the Dundee people were to be congratulated for having gone in for a scheme of this nature.

Mr. Hislop explained that the dimensions of this particular holder were regulated by the Town Council of Dundee. The Engineer's view on this matter was not taken at all. They were told what to do, and it was laid down by the Town Council what sum of money the Gas Department were to spend, and not a penny more would they get. Originally, the ground belonged to Messrs. Keillor, manufacturers of preserves, who were themselves contemplating some big scheme of expansion. But for this circumstance, ground would have been taken for a holder of possibly 5 million c.ft. In regard to another point raised by Mr. Smith, he ought to say very briefly that the tank filled to within 6 in. from the top. There was nothing unusual about the reference to "'Blaw' light steel forms." The plates used were patented by a man known as "Blaw." In his view, fig. 4 was self-explanatory, because there was this reference on the illustration: "Strap bolts on face bolted on top and anchored at A."

Mr. John Wilson (Motherwell) desired to direct the attention of the author to the following statement in the paper: "Due consideration was first of all given to the adoption of iron or steel; but local conditions—such as the continual flooding of the site with tidal water to within 3 ft. of the ground line, and the fact that the tank would be above ground—debarred the selection of this type." He was not at all clear regarding what Mr. Hislop wanted to be at here. What exactly was his reason for making this statement? With regard to the holder proper, did the author consider the question of iron instead of steel? In connection with the painting of the holders, was it ordinary graphite which was used, or one of the graphite silica paints? On one occasion he could recall covering a holder with a creosote paint. It was quite nice for a time, but turned black eventually.

Mr. Hislop remarked that, in regard to the holder, iron had been thought of, but the idea was dropped. The graphite they used was specially made for this work. He would not say publicly who the makers were, but the information could be got privately by those who were anxious for it. It was of very good quality indeed.

Mr. John Frazer (Dalmarnock) said he would be glad to hear from the author why the tank was not put down on the horizontal plan. From figure 3 (b) he took it that the plan practically from top to bottom was a vertical one. Speaking as the outcome of his own experience in water-logged districts, he found that the best thing to do in concrete jobs was to work continuously the whole 24 hours on the three-shift system. By following out such an arrangement, they had no breaks in the concrete at all. Personally, he had had experience of a good many holders, and had always found that, with a holder in use for any length of time—especially in the old days of good fat gas—there was no paint on the interior at all. If the gas was in any way rich in Dundee, then Mr. Hislop's two coats of paint would possibly

now be floating on the surface, accompanied by the oil inside the holder. So far as graphite was concerned, he thought the author was on right lines. From experience, he had found this to be an ideal paint, particularly if it was of good quality.

Mr. J. W. SCOTT (Manchester) considered Mr. Hislop was to be congratulated on the clear and informative way in which he had described this interesting bit of work. Many of them were only acquiring experience in subjects of this kind, and it was good to have on record an account of the construction of the largest ferro-concrete tank in the British Isles. They were pleased to hear that the experiment had proved satisfactory. As a contractor, he had some little experience of the job; and he agreed that considerable difficulties were encountered in the first place with the tank. One could appreciate to the full these difficulties, when it was realized what the site was like. In Dundee, they were confined to a gasholder of this particular diameter, for on three sides of the tank the balcony practically touched the boundary walls. Considerable care must have been taken to make certain that none of the adjoining buildings was involved. On one side there was a building that must run fully 30 or 40 ft. above the ground, and the balcony practically touched it at that point of the circumference. During the war, his firm had supplied two tanks to a Government order which specified red-lead painting. After the armistice, the latter lay on the ground for two-and-a-half years, and of course were pretty well grown-over with all kinds of vegetation, and so forth. In due course, his people undertook to erect them at two gas-works. When they proceeded to remove the material from the spot where it had been lying, they found that the red lead was as good as when it had first been painted on. One of the tanks which was erected never required a touch of additional paint of any description. It was true that one of the top plates which had been bunched with others showed signs of having been scraped; but after this had been painted it was found that over all the plates were in splendid condition. Many times in the course of his experience he had been asked as to the best paint to use on gasholders, and hitherto he had to confess that he had never been able to give what might be called a conscientious expression of opinion. In his experience all kinds of paint had been tried, but he was bound now to say that the best for the steelwork of a gasholder was unquestionably red lead. Speaking now from the point of view of an engineering contractor, he could understand why it was that certain firms complained of poor trade after the armistice. Here, for example, they found a city like Dundee carrying on a 7-million output with a storage capacity of only 2 millions. However, he had been informed a little while ago that in Dundee they did not worry about this, because they carried a big load by water-gas plant. Recently he visited a works where water gas into the holder cost 2s. 6d. per 1000 c.ft. more than coal gas, owing to the price of coke and oil. The Engineer at Dundee was to be congratulated in attacking in a courageous way all the defects in connection with the foundation. He had not been side-tracked, nor had he faced-up to his difficulties in a half-hearted way, just for the purpose of saving expense. A point had been raised by Mr. Wilson, of Motherwell, as to why use had not been made of iron sheets. Recently one or two holders had been erected with iron sheets, and he, for one, was rather disposed to welcome the idea, because of the great difficulty in preserving steel. It was unfortunate, however, but nevertheless true, that they were not now being supplied with the iron sheets of the old days. Indeed, on this point he knew of one holder that was completed in the course of last year. In this particular instance, 40 p.ct. of the sheets were rejected by the manufacturers when they were delivered into the works, while another 15 p.ct. had been rejected after the work had been done. Of course, he did not mean to say that it might not be possible to get wrought-iron sheets in the future. At the present time, however, difficulty was being experienced; and as a matter of fact, if to-day he was building a holder, he would prefer to use steel plates.

The PRESIDENT (Mr. J. W. M'Lusky, of Glasgow) remarked that the importance and value of ferro-concrete was brought home to them very closely in Glasgow three years ago. At that time they had something like £350,000 worth of work where ferro-concrete was right up against cast iron or structural steel—girders, condenser tanks, purifiers, and overhead crane. There was no doubt that the case for ferro-concrete had been proved right up to the hilt as an engineering proposition, and unquestionably many old prejudices had been swept away. He personally regarded it as significant that Sir William Arrol's firm—who had a reputation second to none in regard to structural steel—had now introduced a ferro-concrete department. This spoke for itself, and certainly it was a most important point. If Sir William Arrol's firm felt that it was right for them to have a ferro-concrete department, it clearly showed the lines on which engineers were thinking. If the Corporation of Glasgow considered they were saving at Provan £100,000 by adopting ferro-concrete—a saving of something like 33⅓ p.ct.—then it was a lesson that ought to be taken to heart by smaller works.* To his mind, the choice of paint was not so important as the selection of good plates. He had had experience of gasholders and sea air. He recalled an instance where his company were glibly assured that no holder would stand the sea air of that particular district; but he was not in agreement with this theory, because the old holder was there in beautiful condition. For one thing, the plates had been well selected, and, in addition, they had received ordinary care in the years that had intervened. The paper dealt with a very fine bit of engineering work.

Mr. W. B. M'LUSKY (Halifax) took it that the members of the Association would be interested to know that this was the centenary year of the invention of cement. If there had been no cement available, there would assuredly have been no ferro-concrete tank at the Dundee Gas-Works, and as engineers they should pay tribute of praise to those who had done so much to make their work possible. In Halifax they had an iron gasholder which was built more than sixty years ago. It was rebuilt a few years since, and the firm who secured the contract were the people who erected the original holder. They were specifically asked to supply wrought iron, and the firm took the view that wisdom had been shown in making this request. As a matter of fact, however, they expressed themselves very much on the lines of Mr. Scott that afternoon—that the iron of to-day was not the equal of that supplied sixty years ago. The author had not said a great deal about graphite paint. Probably he did not like to lay emphasis on the fact that the particular brand of graphite most suitable for holders was made, not in this country, but in America.

Mr. J. HARPER (Ayr) remarked that pure red lead was a very good paint for the ordinary gas manager to use. He must, however, stipulate for good qualities, and make certain that he got them. During the coal strike he had considered whether or not he would go in for pure graphite. Graphite paint itself was of no use unless it was the pure graphite. He tried it, and was going to continue it, because in his opinion it beat all the paints he had ever come across, including red lead. During the period of the coal strike, too, he introduced into his holders a film of oil, with very effective results. At that time—which would be recalled as a very hot summer—he was much troubled with water in the services. This film of oil served a useful twofold object, and had proved a valuable expedient.

The discussion was at this point closed, a vote of thanks being passed to the author of the paper.

THE AUTUMN MEETING.

The PRESIDENT announced that the autumn meeting would probably be held in Glasgow, on the first Thursday and Friday in September. The Council were unanimously of opinion that the members would stand two meetings in Glasgow, even in one year, and, of course, he readily acquiesced.

With a vote of thanks to the President, on the motion of Mr. JAMES RICHMOND (Penicuik), the proceedings were brought to a close.

* Mr. M'Lusky has since forwarded the following statement of the actual figures involved.

FERRO-CONCRETE VERSUS CAST IRON.

At the time the contract for the purifiers was let, March, 1921, there was a saving of £46,500 on 22 purifier boxes.

C	£155,200	
F.C.	108,655	(£46,540)

and a difference of £93,400 between the accepted tender for ferro-concrete work and the lowest tender for cast-iron work:

C.I.	£291,840	
F.C.	198,427	(£93,413)

The Gondola Car Dumper.

A "Gondola" car dumper, designed, manufactured, and erected by the Link-Belt Company, of Chicago, is emptying a 50-ton wagon of coal in 1 min. 10 sec., with only one unskilled man and a 35 H.P. motor, at the new Cahokia plant of the Union Electric Light and Power Company, St. Louis. The "Gondola" car dumper is made up of two distinctly separate structures—first, the two roller rings, 24 ft. in diameter; and secondly the transfer table or platen upon which the car stands. It is explained by the "Gas Age-Record" that the transfer table is carried on four rollers—two in the plane of each roller ring. The track for the rollers consists of four wedge-shaped or bevelled castings attached to the underside of the transfer table. The bevel of these castings is such that the transfer table, with the car, would move over to the side support, if it were not restrained. It is held in place, however, by two hook-shaped castings fastened to the ends of the transfer table. Each of these castings engages a roller which is an integral part of the foundation. As the dumper starts to rotate, these hook-shaped castings remain in contact with the rollers, serving as a retarding device for the transfer table. That is to say, there is a relative movement between the transfer table and the rest of the dumper until the car has reached its side support. The angle of the bevelled plates, which causes the table to move towards the dumping side simultaneously with the rotating movement, is approximately 6°, and the distance of car travel from 6 to 12 in., depending upon the width of the car. The movement of a control handle starts the cycle of operations. Upon the dumper rotating 10°, a projection (built on the side of one of the roller rings) operates a track limit switch, which in turn starts the top clamp motor (10 H.P.). This motor pulls the four top clamps downwards simultaneously, until all four have become firmly seated upon the top of the car, and have exerted a predetermined pull on the operating cables. When this predetermined pull has been reached, it displaces an idler, which displacement operates a load switch, thereby cutting-off the motor and setting a high torque brake. With the car firmly held to its dumping side and clamped at the top, the dumper continues to rotate, until the rotating motor is automatically stopped by limit switches at the end of the rotating movement. The outstanding features of this car dumper are claimed to be its fool-proof construction and its simplicity of operation.

Methods of Analysis of Coal.—Experiments made subsequent to the issue of the description of the methods of analysis recommended by the Sampling and Analysis of Coal Committee of the Fuel Research Board (see "JOURNAL" for Dec. 5, 1923, p. 638) have shown that the particular modification of the Kjeldhal method for the determination of nitrogen, described in the interim report, gives perfectly reliable results. There is close agreement between the results of this method and those obtained by a proved modification of the Dumas method due to A. Baranor and R. A. Mott. It has also been proved that copper sulphate is not a suitable substitute for mercury, as stated in a footnote in the report, since its use yields, in general, low results.

LONDON AND SOUTHERN JUNIORS AT POPLAR.

Visit to the Commercial Gas Company's Works.

Despite brilliant weather and counter attractions which must have proved a sore temptation to many, there was a muster of over sixty members of the London and Southern District Junior Gas Association last Saturday afternoon to participate in an inspection of the Poplar Works of the Commercial Gas Company; and all—from the President, Mr. Walter Grogono, of Fulham, downwards—felt amply rewarded for having chosen this way of spending their afternoon, for the Poplar Works are replete with interest. The visitors were received by Mr. P. E. Williams (the Works Engineer), and having been divided-up into parties were conducted over the works; the guides, in addition to Mr. Williams himself, being Mr. R. P. Harris (Assistant Works Engineer), and Messrs. L. W. Boulter, W. F. Brown, and C. P. Shelbourne.

It may be mentioned that the Association paid a previous visit to the works on March 15, 1913, and in the "Journal" for that time, or in Vol. III. of the "English Junior Gas Associations Joint Proceedings," will be found an extended account of the works. During the visit last Saturday, the members were particularly gratified to learn that at present things are exceptionally busy there, and that an increase of 15 p.ct. in the output is being recorded. Yet, everywhere there was a remarkable absence of noise. In fact, among the features of a works which the President rightly termed unique in many respects, must be included extreme quiet and orderliness. Another feature is the quantity of plant to which the name of "Williams" is attached; while a third is the number of different processes carried on.

The Poplar Works occupy a site nearly 20 acres in extent, on the River Lea, not very far from the Bromley Works of the Gas Light and Coke Company. The manufacturing capacity of the plant at the present time is given as 8½ million c.ft. a day of coal gas, and 2¼ million c.ft. of carburetted water gas. The coal is brought up to the works by the Company's own steamers, and is discharged by Armstrong hydraulic cranes into two coal crushers, each having a capacity of 50 tons per hour. The coal is then elevated into hoppers, from which it is distributed by trucks to the retort-houses or outside store-ground. The manufacture of coal gas is carried on in three retort-houses, built at right angles to the river bank; but of these only two are in use at the present time, the third being down for repairs. The houses each contain twenty settings of ten horizontal retorts, 22 in. by 15 in., in five tiers. The retort-house machinery consists of two Williams-M'Phee dischargers worked by hydraulic pressure, and two Arrol-Foulis hydraulic chargers. The settings are heated by regenerative producers, one to each setting. The period of carbonization is twelve hours, working with 11¼ cwt. charges, and the average make per ton of coal is about 70 therms.

The water-gas plant, of Humphreys and Glasgow type, comprises two sections, each of a capacity of slightly over 1 million c.ft. per day. In connection with these units it is proposed to instal waste-heat boilers.

The coke is dealt with by Jenkins' De Brouwer hot-coke conveyors, which take it from the retort-house, and elevate it into hoppers outside for storing and screening. In connection with the handling of coke two features made special appeal. One of these was the three tiny (but powerful) little locomotives, which are employed principally for transporting coke about the yard, and for loading-up barges. The second was a very useful arrangement known as the Harris patent "Vibrator" screen (so named after the inventor, Mr. R. P. Harris, the Assistant Engineer of the works), which has been in successful operation at Poplar for some time past. The proper grading of coke is recognized as a matter of first-rate importance, and the machine in question carries it out in a simple but admirably efficacious manner. The screen, which is manufactured by Messrs. W. J. Jenkins & Co., Ltd., of Retford, was described and illustrated in the "Journal" as recently as Dec. 12 last, p. 709. Prior to the installation of this invention, the coke was passed through a cutter, resulting in a large percentage of breeze, which disadvantage has now been eliminated. By the "Vibrator" screen as seen at Poplar, four gradings of coke are obtained in a very compact space. The arrangement is such that it is said to be impossible for the screen plates to choke-up during the passage of coke and breeze. Where there is a demand for a certain size of coke, the advantages offered by the "Vibrator" screen are most pronounced. It was pointed out in the article referred to that, if large coke only is required, an ordinary jigger screen would pass (say) 60 p.ct. of the coke delivered, the remaining 40 p.ct. being 2 in. and under. This latter would then have to be re-handled and transported to another form of screen, in order to eliminate the fine breeze and small coke, if further sales were desired. With a "Vibrator" screen, however, the whole of the grading is done automatically at one time, and the operation is carried out even more efficiently than in a rotary screen, where choking takes place to a certain extent.

These patent "Vibrator" screens have been in use now for nearly two years. Each one deals with 30 to 40 tons of coke per hour, giving four sizes; and the screen is so arranged that the two largest sizes can be mixed if required, thereby eliminating anything up to ¾ in. The amount of cut-coke size produced per week by these screens—and which is in demand for domestic purposes—amounts to 70 to 80 tons. It has been found that this is the most suitable size for use for steam-raising purposes. The regular and even size of the coke makes for a more even pull of air through the bed of fuel. In fact, in some cases the use of forced draught has been eliminated. The "Vibrator" screens have been fitted to the existing plant without any alteration, and no extra power is required. Coke can be graded into several sizes over one screen, and, what is very important, all the cut-coke size, for which there is a growing demand, can be extracted, thereby saving the breeze made by cutting.

The condensers are of the usual tubular type, and there is also a long length of 18-in. main, on the north side of the wall of No. 3 house, in use for cooling. Six exhausters are installed of varying capacity; and in the engine room the smooth working of three Arrol hydraulic pumping engines, giving a working pressure of 750 lbs. per sq. in., was much admired. There are four tar extractors—two of the Pelouze and Audouin type, and two containing plates with graduated perforations. All the washers are large rectangular vessels, packed with thin boards, on edge, chequer-wise. The first washer is used as a naphthalene extractor, the second and third for ammonia, while the fourth is a final naphthalene washer,—the gas being first passed through three scrubbers.

The visitors found much to interest them in the plant for extracting cyanide according to the Williams patented process. This cyanide plant consists of four purifiers worked in two parallel series; the stream of gas being passed up one box, and down the other, alternately. The cyanogen is removed by passing the gas through a layer of spent oxide, kept in a moist condition by spraying with water or weak cyanide liquor, in the form of a solution of ammonium sulphocyanide. This is distilled with lime to form the calcium salt, and as such (in solution) is sold to the British Cyanides Company; the strength being from 3 to 4 lbs. per gallon. The sulphocyanide per ton of coal equals about 3 lbs; the efficiency of the process at the present time being 95 p.ct. There is also a benzole plant of a capacity of 600 gallons a day, as well as a tar-dehydration plant of a daily capacity of 25 tons.

Purification is effected by means of sixteen boxes 40 ft. square—two series of six for coal gas, and one of four boxes for water gas. Oxide only is used. Of the three station meters, two are 100,000 c.ft. per hour Parkinson, and one of 150,000 c.ft. per hour by the Gas-Meter Company. It need only be said of the governor that it has been in use for many years, and performs its duty very well. The station possesses two storage holders, of a total capacity of about 4¾ million c.ft.

There is at the works a sulphate of ammonia plant which deals with the whole of the ammoniacal liquor of the Company's three stations. The plant, which has a capacity of 10 tons a day, consists of a free-ammonia still and four liming vessels. There are the usual heater and condensers. The two sets of liming boilers discharge their ammonia into one saturator. The waste gases are freed from SH_2 by means of oxide of iron. Provision is also made for burning the waste gases in the oxide kilns. No attempt is at present made to produce neutral salt.

The sulphuric acid used in the manufacture of sulphate of ammonia is provided by an acid plant which has a capacity of about 90 tons per week. The whole of the spent oxide required is produced at the Company's works. The oxide ash is again treated for use in the purifiers. This prepared oxide, to the exclusion of other, has been in use at the Poplar Works for nearly twenty years. The Company carry out the reconstruction of this plant as needed.

The inspection was followed by tea, at the conclusion of which the members showed their keen appreciation of the welcome and hospitality that had been extended to them.

The President remarked that it was something like nineteen years since he last visited the Poplar Works, but Mr. Williams was there then, and received him, as he had received the Association that afternoon, in the most charming manner. Speaking for himself, he must say that he had had a most enjoyable time on both occasions, and was anxious to learn still more about the works. Poplar was a unique works in many respects. For one thing, the sulphuric acid plant was a novelty in connection with ordinary gas-works operations. Another point that had struck him was that they had carried on with the same oxide year after year, using it over and over again. Mr. Williams told him that no oxide at all had come into the Poplar Works for the last fifteen or twenty years. Some of those present might think about this matter, and see whether they could not do the same thing, because oxide was quite an expensive item on a gas-works. They had seen also the hydraulic pusher in the retort-house, which was an invention of the works, and was operating very satisfactorily.

Mr. W. T. Kenshole (Lea Bridge) proposed a hearty vote of thanks to the Chairman and Directors of the Commercial Gas Company for their hospitality, coupling with it the names of Mr. Williams and the four guides who had taken so much trouble in showing them round the works. The afternoon had been an exceedingly profitable one, for the works were extremely interesting. He did not know that they had ever visited a works where it was possible to recognize the spirit and brains of the engineer permeating everything to a greater extent than was the case at Poplar. In the retort-house they found the Williams-M'Phee hydraulic coke dischargers, while elsewhere was other plant patented by Mr. Williams. The working of the station appeared to be somewhat complicated, but this was to be anticipated with works which were laid out many years ago, and had been developed in the meantime. He had been greatly struck by the extraordinarily fine buildings on the works. They were greatly indebted to everyone concerned for the opportunity of making this inspection.

Mr. H. W. Kerridge (Croydon) seconded the vote, and warmly acknowledged the very courteous and patient manner in which the

guides had explained everything to the visitors. As a distribution man, he had been particularly interested in the method of coke separation. Here was a plant giving four grades of coke in one operation, and this careful grading was a very important thing in furnishing satisfactory supplies to the small domestic coke boilers which were now so largely being put out on the district.

Mr. WILLIAMS (after the vote had been heartily passed) said that, on behalf of the Directors of the Company, he had to extend to the Association a very cordial welcome, and he would not fail to convey to his Board the vote of thanks which had just been accorded. Mr. Stanley Jones, the Chief Engineer, would have been with them that afternoon, but for a private engagement which kept him in the country. Mr. Jones had, however, instructed him to do all he could for the comfort of the visitors. The President had referred to the works as being of a unique character. Personally, the works had always appealed to him (the speaker) in this respect. It was a pleasure sometimes to turn from the ordinary gas-making operations—either coal gas or water gas—and refresh oneself by spending half-an-hour on the acid, cyanide, or sulphate plant. This was certainly an advantage which every gas manager did not enjoy. He and his assistants had been delighted to have the members of the Association with them that afternoon.

THE LIGHTING OF PRINTING WORKS.

On Tuesday, March 26, a lecture on the above subject was delivered by Mr. LEON GASTER at the Stationers' Hall on the invitation of the Joint Industrial Council of the Printing and Allied Trades of the United Kingdom. Mr. B. T. EMBLETON, Chairman of the London District, who presided, introduced the lecturer by remarking that good lighting in printing works was a matter in which both employers and workers were directly interested. The lighting of the machining department was particularly difficult; and information on such problems would be very welcome.

Mr. Gaster, in the first part of his lecture, pointed out that good lighting was now regarded as of equal importance to adequate ventilation and heating, and was essential both on hygienic and economic grounds. He referred to the main principles of sufficient illumination, avoidance of glare, and elimination of troublesome shadows, and explained, with the aid of a candle on the table, the meaning of the "foot-candle." Some of the chief differences between natural and artificial lighting were mentioned. Much printing work was done underground, and required artificial lighting almost continuously; but natural lighting must not be overlooked. Dealing with the lighting of compositors' frames, he discussed the merits of direct and semi-indirect lighting, and pointed out the value of light surroundings in softening shadows. As regards the amount of illumination necessary, it would be premature to make rigid recommendations, as the whole question was now being considered by a Joint Committee working under the Department of Scientific and Industrial Research; but in some modern installations up to 10 foot-candles was provided. Each section of a printing works required separate treatment. In particular the method of illuminating the keyboards of monotype and linotype machines needed study. In the machining department low roofs and the presence of bulky machinery made good lighting difficult. In the editorial and proof-reading departments, which involved the reading of handwriting, &c., good illumination was of vital importance.

Surveying conditions in various printing works, the lecturer drew attention to the great variety in the standards of illumination provided. This was clearly shown in the paper read by Mr. Goodenough before the Illuminating Engineering Society in 1912; and several of the tables presented in this paper were thrown on the screen. Speaking from personal experience, Mr. Gaster stated that the cost of good lighting was frequently not more than 1 p.ct. of the wages bill, and a still smaller fraction of the cost of production. It was, therefore, economically well worth while to provide good illumination. In some processes—colour-printing for example—artificial daylight might be used with advantage; but it was desirable to make sure that the light used was really a sufficiently close imitation of daylight. Finally, Mr. Gaster laid stress on the importance of regular maintenance of lighting installations, and on the necessity of having this done by someone responsible for maintaining good illumination—one who was not anxious merely to keep down expenditure to the lowest limit. Obsolete lamps and fittings should not be allowed to remain until they were worn out, but should be replaced as soon as the light was materially diminished. The problems involved in the lighting of printing works could only be solved with the aid of those actually engaged in the industry; and he felt sure that in the inquiry now proceeding their assistance would be extremely valuable.

At the conclusion of the lecture, lantern slides, including some pleasing views of modern gas-lighting installations, were shown. The audience was composed of persons engaged either as employers or workers in the printing industry, a number of whom put questions to the lecturer.

A vote of thanks to Mr. Gaster was proposed by Mr. COLLIS, of the Association of Correctors of the Press, and seconded by Mr. ALFRED LANGLEY, President-Elect of the London Master Printers Federation. All agreed as to the importance of good lighting in the printing industry, and the need of securing expert advice on the subject.

THE PRESENT POSITION OF THE GAS INDUSTRY.

By a GAS ENGINEER.

[With the opinions expressed in this series of articles, the Editor of the "JOURNAL" does not necessarily associate himself.]

Price of Gas, Discounts, and the Sliding-Scale.

If everyone connected with the distribution of gas was seriously to consider and honestly to confess his opinion as to the causes for the comparative non-success of his side of the industry, some very interesting data would be obtained.

In the opinion of the writer, in addition to the evils connected with the sliding-scale system, the main sources of weakness are lack of imagination, thoroughness, and courage. The lack of imagination is obvious to anyone who considers either the present methods of charging or the catalogues of the manufacturers of domestic gas-apparatus. Lack of thoroughness is proved among other things by the fact that there are very few gas undertakings who have any real considered policy in connection with their distribution departments. Many of them copy their neighbours in such things as an elaborate showroom, and flatter themselves that they have done everything necessary; whereas the provision of a showroom is in many cases only the last of a series of reforms which ought to be carried out. Such companies remind one of a very small gas-works in Lancashire, the owner of which many years ago sent his working manager to visit the neighbouring gas-works for information and education. The man returned much enlightened. The thing that had impressed him most was that an exhauster was installed in every works he had visited; and he thought they ought to have one. The owner acquiesced, and the exhauster was purchased. After erection it was found that they had to work with the by-pass fully open. However, it did work; and everyone was satisfied. Seven years later, when the works were purchased by a neighbouring undertaking, it was found that the exhauster, a belt-driven one, was, and had been, running the wrong way. Lack of courage is, alas, too often made plain by the reluctance of companies to scrap old methods and to sacrifice an immediate return for future benefit.

This article is mainly intended to deal with the sliding-scale, price of gas, and discounts. With regard to these the lack of imagination, thoroughness, and courage is apparent. The sliding-scale is a relic of the old days when the competition of electricity was little more than a threat. It also preceded the great growth of the use of gas for purposes other than for lighting. This has had the effect of largely increasing the disparity in the consumption of gas by different classes of consumer. Its introduction was for the purpose of ensuring that the consumer reaped some of the benefit accruing from any decrease in the cost of manufacture; and its success for that purpose is proved by the fact that there was no serious opposition to it until after 1914. The probable reason why the sliding-scale, with all its imperfections, was accepted with little demur up to the war is that conditions were so stable as regards dividends, price of gas, and cheapness of money that it was difficult to find any real, solid, and popular cause for alteration. Having regard to the general value of money, dividends of from 5 to 6 p.ct. satisfied the shareholders and enabled the companies to raise capital without difficulty, while on the other hand consumers did not grumble at a price of gas varying from 2s. to 3s. per 1000 c.ft. The financial effect of the war changed conditions to such an extent that, while the price generally increased no more, if as much, as other commodities, dividends (after deducting income-tax) were in many cases almost extinguished, the value of shareholders' holdings was halved, and the only way to obtain further capital was to issue redeemable debentures at a high rate of interest. Something had to be done in a hurry; and the industry accepted the Gas Regulation Act with most, if not all, of the old weaknesses of previous legislation. Considering the haste with which it was passed, an immense amount of good was accomplished; and if the information gained from its working is considered in the right light, much data have been obtained, from which it should be possible to frame a new Act that would fulfil all the ideals of the old sliding-scale, while at the same time having that flexibility so essential to the success of a great industry.

As the old stability of money and low income-tax have gone, probably for ever, so a new sliding-scale must be evolved which will adapt itself to the new and varying conditions. The gas industry, having a monopoly, is in a greater position of security than an ordinary commercial concern; and therefore the shareholders should be, and are, satisfied with a smaller return in the shape of dividends. On the other hand, the security is not equal to a Government investment; and therefore the shareholders expect, and should have, a higher rate of interest than is paid upon Government stocks. In fixing a standard dividend for the gas industry, the safest way is to take the interest paid by the Government, and add to it a certain percentage as compensation for the less security. The Government rate of interest could be averaged over a period of one, two, or three years, so as to avoid violent fluctuations. By this means, many of the evils of the sliding-scale would be avoided; and if it had been in operation during the difficult war and post-war years, much less would have been heard of the financial hardships of the industry. The

standard price should be fixed upon a national basis, with certain additions for small works and those situated in scattered areas. The price charged by individual companies, the relation of which towards the standard price fixes the permissible dividend, should not be, as at present, the highest price charged within the home area. (The extra charge made per therm for gas used through prepayment meters is assumed to be a rental, not a charge for gas.) It should be the average price charged, and could be obtained by taking the total sum received from the sales of gas, and deducting therefrom the expenditure for free gas service (dealt with later) and the extra charge allowed for gas supplied in outside areas. This net figure, divided by the number of therms actually sold, would then be the price upon which would be calculated, in its relation to the standard price, the maximum dividend which could be paid. These figures could also, if desired, be an average over one, two, or three years, and need not necessarily include the prices charged during the year or half-year of current working.

Leaving this question for the moment, let us consider the present prices charged for gas. There is no doubt that in a large number of cases they are much too high, and that the variations in different districts are much greater than is either necessary or desirable. We will ignore for the present all companies having an annual sale of less than 500,000 therms, for in the case of very small undertakings other considerations arise. When you see undertakings in much the same geographical area, and working under similar conditions, charging prices varying from 8d. to 1s., or even more, per therm, it makes even the initiated wonder, and, worse still, it gives the enemy every cause to blaspheme. What would be said if a grocer (say) at Gravesend, were to charge 50 p.ct. more for an article than the price which prevailed in London? Whatever was said, it is certain that before long he would have to close his shop. Of course, the sale of gas and grocer's goods are not wholly analagous, seeing that gas must be made within a reasonable distance of the place where it is delivered; but no varying conditions of manufacture and distribution can account for many of the large differences in the price of gas which exist at the present time. The excuse most often given is that it is much more economical to make gas in a large than in a small works. While the argument has considerable weight, it has been worked to death; and it is the opinion of the writer that as soon as a works reaches a certain size it can work as economically as the largest works in the country. The limiting size is open to debate, but as a suggestion we will put forward a unit capable of producing one million therms per annum. An undertaking of such a size should be able to make gas nearly, if not quite, as cheaply as the Gas Light and Coke Company, which, though nowadays it is a model of how a large undertaking should be run, has in the past shown many of the weaknesses generally attached to unwieldy concerns.

Excessively high prices charged for gas can only be accounted for by bad management in the past or at the present time; and one of the weaknesses of the present sliding-scale system, as now applied, is that it often enables an indifferently managed concern to pay as high a dividend as the one better run. Bad management in the past often leaves an undertaking with a decrepit works or an inflated capital account, or both; and bad management in the present means that an undertaking is worked on out-of-date lines. Any company which finds itself charging much more than others should at once set itself seriously to think; and if it cannot find a way out, it should either call in an expert or change its directors. When comparing the price of gas in different undertakings, the figures used should not be the nominal price of gas, but the average price obtained, for there is often a great difference between these two figures. It will generally be found that the greater the difference the better managed the concern. It is easy enough for any company to find out exactly what is the cost of gas into the holder, and to compare it with the cost in other undertakings; but when we come to the other charges—such as distribution, management, overhead charges, &c.—it is much more difficult to obtain a fair comparison. All figures relating to the manufacture of gas are worked out, and rightly, on the basis of "per unit of gas made," whether it is the therm or the 1000 c.ft. The other costs, however, have generally been worked out on the basis of "per unit of gas sold," which is not a proper comparison at all, and is totally misleading when considering what extra discount it is fair to allow to large consumers. The consumption "per mile of main" is useful for some purposes; but the vital figures from the distribution point of view are the consumption and cost "per consumer." Only from the proper understanding of these figures is it possible to formulate a scale of discounts for varying consumptions which will be fair to all classes of consumers.

In the great majority of cases at present the scale of discounts for large consumptions is grossly unfair to many classes; and there are cases where no such scale exists. To illustrate this point, let us assume that an undertaking is working under the following conditions:

1. Size, 2 million therms per annum.
2. Number of consumers, 20,000.
3. Cost of distribution (charges exclusive of maintenance of pipes, meters, and stoves, but inclusive of management), 2½d. per therm.

Assuming no special discounts for varying consumptions, it is possible to work out the amount per annum which various consumers would pay towards the charges enumerated in item 3. Some of these are:

	£	s.	d.
A consumer using 100 therms	1	0	10
,, ,, 10 ,, ...	0	2	1
,, ,, 10,000 ,, ...	104	3	4

Seeing that the cost of maintenance, &c., enumerated in item 3 is the same for each consumer, irrespective of the quantity used, it will be seen how inexcusable the charges are. The average cost per consumer is 20s. 10d., so that strictly speaking this should be a charge to every consumer, in addition to the actual charge for gas. As it is, the smallest consumer pays 18s. 9d. too little, and the largest consumer pays £103 2s. 6d. too much. From these figures it will be seen that a large number of small accounts are a dead loss to the undertaking concerned; and this loss has to be covered, where the full allowable dividend is paid, by over-charges to other classes of consumer. If the full dividend is not paid, the loss is borne by the shareholders. Whoever makes good the deficit, the principle which penalizes one class at the expense of another is wrong; and though it is getting more common every day in the form of taxation, there is no reason why it should be perpetuated in the gas industry. In addition to the actual injustice already mentioned, it handicaps the industry, and retards the natural development of the use of gas for domestic as well as industrial purposes. Under existing conditions, the only method of amelioration is to adopt a generous scale of discounts for consumers burning more than the average quantity; and here again you are up against another difficulty in persuading many directors that such a course would be to the benefit of their undertaking. All they see is that the granting of the discounts means an immediate drop in revenue, which may prevent their reducing the nominal price of gas, and so increasing their rate of dividend. Many of the scales of discounts already in existence are absurdly insufficient. What inducement is a discount of (say) one-fifth of a penny per therm to a consumer using 1200 therms per annum? To do any good, the discount must be of sufficient importance to act as an incentive to the increased use of gas.

Assuming that the principle of discounts is granted, the next question is, How shall it be given? Shall it be given in the form of a cash discount on the amount of gas used, in the form of free service, or in a combination of both? There is much to be said for the last proposition, for nothing annoys a consumer more than having continually to pay out sums for the maintenance of existing apparatus and accessories. Free inspection of apparatus, with the necessary repairs, cleaning, and reinstatement of parts, would be a boon to all consumers, and would make the use of gas in many a household an advertisement for others and an incentive for increased consumption by the occupier. As a general rule the fact that apparatus requires cleaning or repairs means that it has been used, and that the company has made a profit on the sale of the gas, part of which can properly be spent in enabling the consumer to use further gas under the best conditions. Moreover, the amount of repairs and replacements required will be in somewhat the same proportion as the amount of gas consumed. Often the consumer who is blamed for having a dirty and greasy cooker has neither time nor ability to clean it properly. After all, if it is greasy, it shows that it has been used for cooking purposes, and not as a boot cupboard.

Whatever system is adopted will, in some instances, be abused; but does that really matter? The man who goes through the world in constant fear of having advantage taken of him will do little either for himself or for the community.

All large and successful business concerns have a most elaborate and efficient system of costs, for without it they have found that it is impossible to say which part of their output is making a profit, and which is not. The gas industry, to be truly successful, must do likewise. Individual undertakings have, moreover, the supreme advantage of not being in competition with each other, so that comparative figures and methods of working should be freely available to all. The reader of these articles will find the hankering after statistics cropping up, like King Charles' head, in almost every page; but the writer refuses to apologize, for the more he thinks of it, the more important do they appear. The "keeper of statistics" should hold almost cabinet rank among the staff of any properly-organized gas undertaking, and still more so in the ranks of the National Gas Council and the British Commercial Gas Association.

"Know what you are doing, that you may know what to do."

Midland Junior Gas Association.—At a meeting in the Council House, Birmingham, to-morrow evening (April 10), Mr. F. S. Townend, B.Sc., of London, will read some "Notes on the American Gas and Coke Industry." The annual general meeting is fixed for May 1.

Internal Combustion Engines.—The Gas, Oil, and Diesel Engine Sections of the British Electrical and Allied Manufacturers' Association are collaborating at the present time with the British Electrical Supply Association in drafting specifications for internal combustion engines. In connection with these specifications the Electrical Research Association have, at the request of the Standardization Committee, carried out tests to determine the maximum degree of cyclic irregularity which can be permitted in the engine to prevent objectional flicker in the lamps. Other important work is proceeding on the standardization of Diesel fuel oils, lubricants, &c.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Works of Messrs. Wilsons & Mathiesons, Ltd.

Members of the Association, to the number of 96, visited the undertaking of Messrs. Wilsons & Mathiesons, Carlton Works, Armley, Leeds, on Saturday, March 29. On assembling, the visitors were divided into nine groups, and conducted round the works by members of the firm. A time signal had been prearranged, whereby, on the ringing of a bell, the parties moved from one department to another, thereby avoiding crowding and confusion. In the time available it was not possible to visit the Scotch foundry department where, in addition to gas-stove castings, the firm produce large quantities of porcelain-enamelled baths, kitchen ranges, mantels, fireplaces, &c. The visit was therefore confined to the gas-stove department at the Carlton Works.

Three large assembling shops were visited, where the various castings and component parts of appliances are assembled. Among the work in progress, the visitors saw the building-up of the "Advance," "Premier," and "Royal" cooking stoves; "Sola" gas-fires; "Brighton" condensing stoves, and wash-boilers. The spraying, enamelling, and stoving of various appliances were witnessed. The ingenious construction of the "Circulator" water heater was admired, and the visitors were able to see the various copper parts being brazed. On completion, these circulators are tested under 40 lbs. pressure with boiling water, and afterwards at the same pressure with cold water. The testing of the metal-rod thermostat was seen. It was interesting to note the particular care exercised in the testing under pressure of all cored castings and burners, to ensure that every piece is perfectly sound and gas-tight before being passed into the works for machining.

In the general machine shop all parts are machined in jogs, ensuring accuracy and interchangeability. In addition, all dies for press work are made there, and all repairs to plant and tools carried out. It was clear that a great deal of thought had been expended in every direction. To see the large and small presses at work producing the parts for the "Sunbeam" fire was most interesting. The various sheet-metal sections comprising a complete fire, the visitors were informed, have to pass through thirty-six operations in all before they are ready for assembling. Various other work was also being carried out in the press shop, from the making of small washers to the stamping-out and embossing of the sides for the "New World" gas-cooker. These, it was pointed out, have the runners embossed on them for supporting the shelves and grids, a factor which obviates the use of hanging gates or shelf rests. Electro-plating in nickel, brass, copper, &c., lacquering, and work entailed in the various finishes of gas-fires were noted.

In the radiant-making shop the preparation, moulding, and pressing of the fireclay were seen. After moulding and drying, the material is stacked in firebrick partitions on trucks, and conveyed through a tunnel kiln, where the radiants are heated gradually to the firing temperature of 900° C. After firing, each radiant is examined carefully and dressed to a gauge. The firebrick shop was also visited.

In the brass-machining shop, where there are many automatic and capstan lathes, and milling, drilling, and plugging machines, there is every facility for turning-out gas cocks, injectors, and various other fittings. The capstans, it was explained, are fed with brass rods enclosed in a guard rail. The brass injectors, &c., made from these rods are screwed, ground, and then automatically cut-off into the required lengths. All gas-fittings, it was stated, are tested at 6½ in. pressure before being passed to the stores. The brass fender screws for gas-fires are made automatically, the small screwed and moulded knobs coming from the rod direct to their finished state by the working of one machine, which is kept constantly on this job throughout the year. The automatic machine for these knobs has increased the output fourfold. Cuttings collected from the machines are melted-up and used again.

The assembling of the "Sunbeam" fires is done by female labour; and the accurate finish of the parts makes this a speedy operation. The boxes into which fires are packed for dispatch are bound with wire, and not nailed. The well-equipped and carefully-arranged stores were inspected. An interesting collection of gas-fires (including the original fire made by Mr. Henry Wilson in 1878) showing the various advances in construction from the original up to the present-day apparatus had been arranged for the information of the visitors.

After the inspection of the works, the visitors assembled in the experimental department. Here, Mr. HAMILTON DAVIES took the opportunity of saying a few words regarding the "New World" gas-cooker, emphasizing some of the salient points. An adjournment was afterwards made to the Queen's Hotel for tea.

The PRESIDENT (Mr. W. Heathcote, of Halifax) expressed appreciation of the interesting and instructive visit, and the hospitality of Messrs. Wilsons and Mathiesons, Ltd. One often applied the word "wonderful" to things nowadays, but it could be truly applied to the things they had seen that afternoon. Messrs. Wilsons and Mathiesons were heartily to be congratulated on their fine plant. He had been impressed by the large number of "Sunbeam" fires, and wondered where they could all be going. He had pleasure in asking Mr. C. S. Shapley, the Leeds City Gas Engineer, to propose a toast to Mr. James Wilson, and to Messrs. Ernest, Walter, and Harry Wilson, and also to couple with them the staff and workpeople who had sacrificed a fine Saturday afternoon to show the visitors the different processes under working conditions.

Mr. C. S. SHAPLEY thought he was rather out of place in moving the vote of thanks, but said he was delighted to have the opportunity, as he had a very warm place in his heart for the Yorkshire Junior Association, to which he was proud to belong. He had been to Messrs. Wilsons and Mathiesons' works on many occasions, and had seen the marvellous simplicity with which the "Sunbeam" fires were constructed. With regard to that day's visit, they must all have had a most enjoyable and instructive afternoon, and one which would not have been possible had it not been for the good grace of Mr. James Wilson, his nephews, and the staff and workpeople, who had all contributed to making the afternoon a great success. In proposing thanks on behalf of the members, he very sincerely thanked them all for giving their time in order that the visitors might see the plant under working conditions.

Mr. S. H. PACKER (Bradford), seconding the vote, said the gas industry in general, and in Yorkshire in particular, was indebted to Messrs. Wilsons and Mathiesons for many things. They were a firm of whom Yorkshire was proud.

Mr. JAMES WILSON, responding, said he spoke to the gathering as a fellow worker in the industry. They were all working for the same end—to popularize the use of gas. His firm manufactured the goods, and the visitors saw to their sale and use. The firm greatly valued criticism, and even complaints, by the salesmen, because they all added to experience. He particularly welcomed the advent of the salesmen's circles, which had enabled the manufacturers to get into contact with the people who were selling the apparatus. He had often been struck by the large amount of information that anybody manufacturing gas had to give. That afternoon they had added to their own knowledge an insight into the different processes through which gas-appliances had to pass. They were making for efficiency. Before the war, a few extra cubic feet of gas per hour did not seem to matter; but the time was coming when even a cubic foot of gas per hour would make a difference sufficient to influence them in choosing between one make of appliance and another. If they all wished to be successful in popularizing the use of gas, so that it would become the universal source of heating, the apparatus with the lowest consumption should be chosen. The firm were delighted to have had the opportunity of entertaining the visitors.

Mr. WALTER WILSON said he wished to apologize for the unavoidable absence of the Chairman of the Company, Mr. Mathieson. For his brothers and himself, and on behalf of the staff also, he could say it had been a pleasure to help in showing them round the works, and to note the close interest taken in everything seen. They hoped that what had been demonstrated had been sufficiently interesting and valuable for them all to carry away some lasting and serviceable recollections of the Carlton Works.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Visit to Neath Gas-Works.

The Association visited the Neath Gas-Works on Saturday, March 29. Mr. W. Clark Jackson, Engineer and Manager, who met the party on arrival, briefly welcomed the members, and then conducted them over the works. They were shown the Glover-West vertical retorts; and points of interest were carefully explained in detail. Mr. Jackson emphasized the fact that he used Welsh coal entirely, and obtained a gas of an average calorific value of 429 B.Th.U. At Neath they were able to dispose of all their coke without difficulty, and obtain a good price for it in the condition in which it left the retort. There was no coke in stock. As soon as it was made it was delivered for use.

After inspecting the retort-house, the members were shown two Babcock & Wilcox water-tube boilers. These were being scaled when the members were present, and they were able to see the deposit cleared with the patent scaling apparatus. Cooker repair shops were also visited; and Mr. Jackson explained the method he adopted in renovating cookers and appliances. He mentioned that he had one type of cooker, and sold it at a fixed charge, complete with plate-rack and stand.

The members then proceeded to the Gwyn Hall Council Chamber, where the President, Mr. T. A. Canning, took the chair.

Mr. JACKSON formally welcomed the meeting. He stated that he was particularly pleased with the large gathering that afternoon, and it afforded him great pleasure in making them welcome to Neath. They had been able to inspect his works, and would realize that he had attempted to have up-to-date manufacture with some degree of success. Neath was a town not subject to the same depression that might be experienced in other parts of South Wales, as they did not depend upon one industry for their trade. He hoped that the meeting would be useful, as he was sure that the younger men of the industry could gain knowledge by visits such as they were making that afternoon, which would enable them to decide what type of plant to adopt when they attained administrative positions.

Mr. CANNING, in moving a vote of thanks, said that the Association were grateful to Mr. Jackson. Not only was he holding the chief position in the Neath undertaking, but he was also President of the Wales and Monmouthshire District Institution and in that capacity they were particularly pleased to have him with them.

The SECRETARY (Mr. B. J. Bell) seconded the vote, and men-

tioned that it was an incentive to the Junior Association to have the goodwill and assistance of the parent body, and the presence of its President. Without that help they could not hope to expand and do the useful work which it was their policy to inaugurate. He was sure that the members would give Mr. Jackson their cordial thanks for what had been a most instructive visit, and for his general interest in the Association's affairs.

The President then called upon Mr. A. C. Prankard (Cardiff) to read his paper on

DISTANCE CONTROL.

We juniors are constantly being reminded by the seniors that the future of the gas industry is entirely in our hands, especially in these days of keen competition, and that we should do our utmost to benefit the industry by making the best use of everything which may come our way to further the interests of gas. This sounds very well, and we appreciate the obligation; but the point is, Do we get the assistance due to us? I am afraid we do not. For instance, appliances have from time to time been brought to the notice of seniors to assist the progress of gas. They have been tried half-heartedly, put on the shelf, and then forgotten. This is not fair to us. If these appliances are not brought to our notice, how can we be expected to get the best results from them? How often in the course of our daily routine do we hear consumers say that they know electric light is dearer than gas, but that it is far more convenient. We all know that there are appliances to be obtained that will assist us to make gas as useful and convenient as electric light, and certainly more reliable. In the short space of time at my disposal, I propose to deal with a number of appliances which have been somewhat neglected in the past, but which, properly fixed, are of immense value to the consumer.

The "Norwich" System.

This system, now obsolescent, has a few points of interest, and, as will be stated later, has one very great disadvantage. It will therefore only be described briefly. It consists of a specially constructed by-pass tap, a by-pass attachment, and a small valve. The tap is cast in brass, and in shape is not unlike a tee piece, except that the centre portion is turned the opposite way. The back portion is cast solid, so that the flow of gas has to be diverted through a small channel into the centre portion, and out through a similar channel direct to the burner. The centre portion is fitted with a gas-tight plug similar to an ordinary tap, and this is held in position by means of a screw and washer; but, instead of the gas-way being cut through the centre of the plug, a small portion is cut away at the back. The plug is actuated by means of a small stem, at the end of which is a knob. The stem passes through a small slot, which prevents the plug from being turned too far either up or down. On the top of the tap is a small screw. This is to set the plug to allow sufficient gas to pass to supply the pilot light. The tap is fitted with a small hard-wood collar and a metal cap, and these give it the appearance of an electric-light tumbler switch. The by-pass attachment and small valve are fitted to the burner. To operate the switch, the knob is pushed down. This turns the cut-out portion of the plug into line with the two channels; and the gas then passes along the pipes. The pressure of the gas lifts the valve at the burner, and the gas is ignited by the pilot light. When the knob is pushed up, the cut portion of the plug is turned away from the two channels, and the spaces are then covered by the solid part of the plug coming into line. One disadvantage of this type of switch is that the pipes have to be laid in, or on the surface of, the walls to convenient positions for the special taps.

The "Telephos" Inverted Set.

This switch set consists of several parts—controller, battery coil of wire, igniter, and push. I will endeavour to describe each in detail.

The Controller.—The whole of the electrical mechanism is neatly packed away in a small metal drum, which is termed the controller. This is composed of a disc valve, electro-magnets, an armature coil, a small valve which controls the igniter, and wire terminals. Above the baseplate of the controller, in which is drilled a number of holes at equal distances apart, is fitted a toothed disc valve with corresponding holes; and it is through these holes that the gas passes to the burner. This valve is operated by means of a pawl. When the gas has been extinguished, all the holes in the baseplate are completely covered by the blank spaces in the toothed disc valve. A good point about this set is that it is supplied with a mechanical device whereby, should the electrical or other parts fail to operate, the consumer can light up. This device is in the form of a small knob attached to the lower part of the controller. Should it be necessary to use this, all that is necessary is to pull the knob and light up with a match in the ordinary way. The light is then extinguished by merely pulling the knob.

The Battery.—To obtain the best results, a dry battery should be used, as the Leclanché or wet cell, having too high a resistance, would not give the requisite amount of current for any length of time. Further, it has the objectionable habit of creeping, and this causes corrosion. It is important that care should be taken in selecting the position for fitting the battery. The spot chosen should be cool, yet perfectly dry; otherwise the life of the battery will be very short. A new battery should read 6 volts and at least 12 amps. A lower voltage than this would give very poor results, while anything higher would cause the platinum igniter to fuse. When the amperage of a battery has fallen to about 3 amps., it is time to replace it.

The Wire.—It is very important that only the correct gauge and length of wire should be used when fitting these sets. The standard is 36 ft. of 22-gauge twin wire. Should a greater length than this be required, then a thicker gauge wire must be used—*i.e.*, one with a lower resistance. Thus, where the length is more than 40 ft., 20-gauge wire should be used. In no case can less than 36 ft. of 22-gauge be fitted, for with less than this amount the available current would be greater than necessary to operate the set, and would eventually cause the platinum wire in the igniter to fuse. When wiring, do not drive the staples over the two wires, because this is an easy way of causing short circuits. Staples should be put in over one wire only, and not driven home too tightly.

The Igniter.—This consists of two very fine brass tubes bent neatly at the top to fit into the insulated part provided for them in the controller, while the other ends are connected by means of a fine platinum wire. These tubes form the by-pass, for in operating the set the current causes the platinum wire to glow, and ignite the gas which passes over it. Care should always be taken to see that the platinum wire is brought directly under the bottom of the mantle, yet kept clear at least half-an-inch.

The Push.—The push or contact-maker is similar to an electric-bell push; and the only care needed with this is to make sure that the press button does not stick. This type of switch should not present any difficulties to the fixer, for the wiring, which is generally the worst part, is a very easy task. If white lead is being used in connecting the controller to the gas-fitting, it should be used very sparingly, so as to avoid any possible chance of causing an obstruction. Without going into too much detail, I will endeavour to explain how the switch operates. The push button is pressed (not jabbed), causing the current to flow through the wires to the coils. The magnet thus actuated attracts the armature, which then moves the disc valve round by one tooth, causing the holes in the baseplate and disc valve to come into line, and thus allowing the gas a free passage to the burner. At the same time the current flows through the platinum wire of the igniter and causes it to glow and ignite the gas. Each time the push button is pressed, this movement of the disc valve is repeated, alternately opening and closing the main gas-way. Hence, to extinguish the light, all that is necessary is to press the push button once more.

Sugg's Distance Control.

The type I intend dealing with is shaped like a stirrup. The gas passes through the bent arms into a small circular chamber at the base. The top of this chamber is covered with a very thin leather diaphragm, which, though soft and pliable, is exceedingly strong. It is made to fit close on the outside of the chamber, yet the top is sufficiently slack to allow it to inflate when the gas is turned on. The diaphragm is well protected by means of a small metal cap firmly held in position by four screws. Through the base of the chamber are two passages, one larger than the other. The larger of the two is the outlet to the burner, while the smaller is the outlet to the flashlight. The main gas-way is fitted with a pear-shaped plug, through which passes a very fine wire stem, which in turn passes up through the diaphragm. On the top of this stem is fixed a small metal weight, which assists the plug to drop back into its seating when the gas is turned off. The smaller gas-way which controls the flashlight is fitted with a small cylinder-like valve; and this also has a small stem passing up through the diaphragm. These stems are held in position by means of small washers, one fixed directly above the diaphragm, and one below, and both are screwed together tightly to prevent any leakage in the diaphragm. On one side of the control is the by-pass connection, on the other is a small screw which controls the length of the flash. This type of control is capable of controlling any number of lights without the aid of a separate supply being run to the by-passes; but it is essential to have a by-pass tap, and this must be set by means of the screws provided to by-pass just sufficient gas. The tap must be fixed in a convenient position.

The control operates as follows: The by-pass tap is turned on, and the gas passes through the stirrup into the circular chamber, where the pressure causes the diaphragm to become inflated. Since the pear-shaped plug is attached to the diaphragm, this action lifts the plug from its seat and allows the gas to flow through the passage to the burner. At the same time, the small valve which controls the flashing by-pass comes into operation. When the gas first enters the small chamber it rushes to the by-pass and causes the flash, but as the chamber fills up, and the diaphragm becomes inflated, it draws up the small valve, and the supply to the flash is shut-off. When the by-pass tap is closed, and the pressure reduced, the diaphragm contracts, and the pear-shaped valve drops back onto its seat again, thus closing the main gas way, while at the same time the by-pass becomes normal.

The Pneumatic Switch Set.

I consider that the pneumatic switch set is ideal, and will answer the purpose for which it is intended, if only proper precautions are taken when fixing; and I see no reason why it should not become one of the biggest boons and blessings to all gas undertakings in the country. I have carried-out a few experiments at different times, and have found them both useful and instructive. No doubt you have received numerous complaints about these sets, but no one with any intelligence will deny that this apparatus is more sinned against than sinning, through insufficient care being exercised when fixing.

The pneumatic switch set consists of three important parts—push, valve, and coil of tubing. The push is made in the form of a drum with a plunger inside, to which is attached a knob. When this knob is pressed, it compresses the air in the drum, and the impulse is carried along the tubing and actuates the valve at the other end. The valve is neatly made, so as not to interfere with the decorative lines of the fittings, and can be obtained in various sizes from $\frac{3}{8}$ in. upwards, and also in any colour. It is fitted with male and female threads to facilitate easy fixing. The by-pass is on the side, fixed clear of any working parts, thus ensuring a constant supply, which is essential for satisfactory working. I will now draw your attention to the most important part of the whole apparatus, which I call the piston, because it is constructed on somewhat similar lines to the piston of an engine, only, instead of a series of grooves, this has only one groove, which is cut very deeply. The piston is arranged so that it will slide backwards and forwards through the small cylinder which forms the centre of the valve with just sufficient freedom to ensure easy working, at the same time avoiding leakage. The cylinder is bored through the centre of the gas-way, so that, when the piston is inserted to its limit, the groove rests directly in the gas-way, and allows the gas to pass freely to the burner. But when the piston is withdrawn, which action takes place each time the knob of the push is pulled, the solid part of the piston comes into play, and blocks up the gas-way, thereby cutting-off the supply to the burner. It is most important that the utmost care should be taken when handling these parts of the valve, because if they become marked or bruised in any way, the valve will either leak or fail to work easily. On one side of the valve provision is made for connecting the brass tubing, while on the other the end of the piston shows through. These parts are made in the form of caps, are easily unscrewed by hand, and are transferable. This is very handy for the fixer, because sometimes, when screwing the valve to the fitting, the extra part of a turn is needed to ensure a gas-tight joint. Should this be so, then all that is needed is to remove both caps, pull out the piston, and insert at the other end, not forgetting to replace the caps. It has been common practice to fix these valves directly above the burner (that is, with the inverted type) protecting them from heat with asbestos. This is bad practice, and should not be done, because it is undeniable that prevention is better than cure. We all know that heat causes metals to expand. Consequently, if the valve is fixed directly above the burner, the heat to which it is subjected will cause the working parts to expand, and thereby cause unsatisfactory working, due to sticking.

Only the best types of burner should be used in conjunction with this apparatus. Some cheap types of burner are fitted with gas and air regulators, it is true; but those burners are so loosely built-up, and parts so ill-fitting, that anything like complete regulation is utterly impossible. Then again, with the working of the piston to and fro, a very light vibration is set up; and unless you have a burner with well fitted gas and air regulators, the pneumatic switch set stands a poor chance of being a success. What can be worse than a burner continually back-firing and giving a poor light?

The tubing requires careful handling when fixing, because, being so small and of no great thickness, it is easily bent or kinked. Care should also be taken when driving-in the staples, first to see that they are opened sufficiently wide to clear the tubing, and then not to drive them home too tight. Care should be taken to keep the tube close to the fitting, and to follow the lines of decorations as near as possible, tacking the tube neatly here and there with the smallest bit of solder, or binding with fine wire, which will keep it in position. Another important point which has been overlooked by many is to see that the proper length of tubing is used in conjunction with the correct size of push.

The tubing, owing to its perishable nature, is very easily affected by damp; and it is a common practice in many places where it is necessary to bury the tubing in the plaster, to thread it through another tube of slightly larger diameter, such as $\frac{1}{4}$-in. or $\frac{5}{16}$-in. compo, as a protection. To my mind this is unsatisfactory, for, unless the ends of the outer pipe are efficiently sealed, there is nothing to prevent the damp creeping, and doing as much damage as if the tubing was used alone. Further, considerable additional expense is caused by this method. Some years ago I had an experience of this sort. A set was fixed in the hall of a house, of which the walls were very damp. Time and again the tubing had perished and been renewed, but all to no purpose. So, instead of renewing the tubing again, I cut the whole lot out and substituted $\frac{1}{8}$-in. compo, using short ends of brass tubing with the caps and cones, and soldering them inside the compo. There has been no complaint since. Profiting by this experience, I have always made it a rule, wherever there is the least sign of dampness, to use $\frac{1}{8}$-in. compo, instead of brass tubing. There is nothing much to be said about the push, because there is really nothing to get out of order. The chief points are to see that the air outlet is clear and that the drum and barrel have a smearing of vaseline over them to ensure easy working. Should two or more pushes be required in a room, a neat practice is to remove the outlet tube from the top, and refix it in the back, mounting the pushes on a hollow back-block, which makes a neat and pleasing job.

One very interesting purpose to which the pneumatic switch set can be easily adapted is for illuminating window displays after the premises are closed. By means of a few alterations which I have made, the action is reversed. The stem of the piston is cut away, and a new stem inserted at the other end. A small spring is fixed inside the drum of the push, in order to keep the actuating knob in position. Thus, when the knob is pressed, the gas is ignited by means of the by-pass, and will remain alight until the pressure is removed, when the gas is automatically shut off. The push should be fixed to the outside of the window frame in a conspicuous position. Near the push should be placed a small glass sign with directions for the interested public such as: To inspect our window display when the premises are closed, please press the knob.

THE KEITH AUTOMATIC LIGHTER.

The "Keith" automatic lighter is designed to operate where a considerable difference between the normal and the high-pressure supply exists. The apparatus consists of a valve body and a cover, between which is held a thin diaphragm. This diaphragm is of silver, a metal which has been found to be the most satisfactory, since it does not easily corrode nor does it flake with the heat. The valve seat is constructed in the body, and normally the diaphragm is pressed on the valve seat by means of a plunger actuated by a spiral spring. The tension of the latter is adjustable by means of a small screw. The gas enters the top of the valve body, but cannot pass to the outlet because the gas-way is closed by the diaphragm. As soon as the compressor is started, the gas pressure is raised to a point when the resistance of the plunger spring is overcome and the diaphragm is released from the valve, thus allowing the gas to pass to the burner. The gas continues to pass to the burner until the pressure is reduced on stopping the compressor. Obviously some arrangement must be made for controlling the pilot light; otherwise, when the pressure is increased, the length of the pilot would be increased to an objectionable size. The movement of the diaphragm is therefore utilized to govern the pilot light. Under low pressure, the gas passes by means of a port cut in the valve body to a channel communicating with a small chamber in the cover, which supplies the pilot light.

The size of the light is governed by a small screw fixed at the end of this chamber. When the pressure is increased, the movement of the diaphragm causes the other end of the plunger to operate a small valve which closes the chamber supplying the pilot. The pressure in the chamber is increased for a moment before the valve operates, and a flash is thereby caused in the pilot, thus igniting the burner. Immediately afterwards, however, the supply to the pilot is cut-off by the completed movement of the plunger. The supply to the pilot under the high pressure now in operation is obtained through another small port communicating with the small chamber in the cover. This port is regulated by another screw, and is so arranged that gas will only pass to the pilot when the high pressure is in operation, and in just sufficient quantity to give a very small light, and so prevent air getting into the by-pass tube. When the compressor is stopped, and the pressure falls, the diaphragm again covers the valve to the outlet, cutting off the supply to the burner, and at the same time the movement of the plunger on the diaphragm opens up the valve connecting the pilot to the low-pressure supply. In order to shut-off a lamp entirely, without the aid of separate taps, the valve body is fitted with a stuffing box, through which is a screw-down tee handle. This, on screwing down, closes the gas-way, thus preventing the diaphragm from operating. The cover can then be removed for the purposes of cleaning and inspection while the pressure is on. Should the diaphragm be removed, it is necessary to observe precautions in re-fixing. The screws in the cover should be screwed-up barely hand-tight at first. Then, when the high pressure is turned on, the screws should be tightened. This will allow the diaphragm to become slightly bagged, thereby obtaining the necessary play. It is also very important that the by-pass tube should be kept clear, in order that the action of the diaphragm should not be impeded through the pressure being unable to find its way to the proper outlet.

Mr. T. A. CANNING, in proposing a vote of thanks to Mr. Prankard, said that the paper had been a most interesting one. With regard to the "Norwich" switch, he thought that the defects of the system were obvious. Dealing with the "Telephos" system, he said that it was largely attacked by electricians, as the principle of the whole system was dependent on the electrical current. He thought that the chief objection to this switch was the constant renewal of batteries. He had found with Sugg's system of distance control that the chief objection was due to by-passes blowing out. The pneumatic system was certainly very convenient, but he had two objections against it—first, that he had not always found the arrangement gas-tight at higher pressures, and, second, that tubes on the outside of pendants, brackets, &c., did not look neat and tidy. The latter difficulty could be obviated by introducing the tube inside the pendant or burner tube. However, no switches were foolproof. The progress of distance control was impeded by the present high prices of gas switches; and, until makers produced a high-class article at a low price, he could see no extensive future for this most serviceable article. He thought that the suggestion that a switch should be fitted outside the showroom window was a very good idea.

Alderman J. COOK REES, O.B.E. (Mayor of Neath, and Chairman of the Neath Gas Committee), was asked to address the meeting. He said that Neath was a small but progressive town. He felt some degree of satisfaction in finding so many present, as he knew from experience that committees had to depend upon experts for advice. It was absolutely necessary that such committees should have confidence in their chief officials, and he was pleased that Mr. Jackson was present to encourage them, as he was a man on whose ability Neath had placed great

reliance. It behoved every expert to be master of his job, otherwise his advice would be worth very little. It was a matter of considerable satisfaction to him personally to see so many young men interested in their vocations. He did not intend to say a great deal about the practical side of the gas industry, but he would mention that in his capacity of Chairman of the Gas Committee, and as an architect, he was sure that there was an expanding field open to them for their commodity. He had listened to the remarks made regarding switches, and agreed that they were open to some improvement.

Alderman Cook having invited the members to tea, the President announced that the discussion would be resumed afterwards.

During the ensuing discussion, Mr. C. Collins (Swansea) offered some criticisms on switch lighting, in which he brought forward several practical points in connection with the fitting and use of distant lighters. Mr. C. G. Brown (Cardiff) followed, and further remarks were made by Mr. A. H. Shepherd (Swansea) and Mr. B. J. Bell (Cardiff). A vote of thanks to the Mayor for his kind invitation was cordially passed.

THE CENTRIFUGAL SEPARATION OF GAS-WORKS EMULSIONS.

By T. H. Prater, of Tottenham.

[A Paper read before the London and Southern District Junior Gas Association, March 21.]

The question of emulsions is of great interest to all engineers, and perhaps especially to gas engineers, who have to deal with large quantities of liquids very prone to emulsification. We have all heard of the trouble caused by circulation lubricating oils forming an obstinate mixture with condensed steam—an emulsion so intractable that constant filtration has failed to effect separation. These oils have consequently been degraded to the position of conveyor lubricants, for which purpose they are not as efficient or economical as the proper oil.

The common causes of the emulsification of circulation oils in use are the ferric oxides or iron salts present, which come from the machinery, and these have a powerful emulsifying effect if only present as a fraction of 1 p.ct. Though these particles are heavy when compared with similar volumes of oil or water, yet, owing to their presence in the form of a suspended colloid, the force of gravity is not sufficient to cause separation; and only when this force is multiplied several thousand times, by substituting centrifugal force, can the oil and water be compelled to part.

The emulsion which is present to the greatest extent on a gas-works is, of course, the mixture of tar and water; and though it has been proved by French experience that water in coal tar can be kept under 4 p.ct. by careful methods of arranging seal pots and inflows to storage wells, &c., such a percentage is usually exceeded. It has also been shown by American experiments that selective condensation goes a long way towards reducing trouble from the worst of all emulsions with which we have to deal—namely, the water-gas tar emulsion. The separation of a portion, if not of all, of the entangled water in tar emulsions will most likely result in an increased revenue from tar sales and a more efficient liquor recovery figure.

Although coal-gas tar can be successfully dehydrated by heat treatment alone, the separation of water-gas tar by this means is a difficult task, and a source of danger from fire, due to priming. As water-gas tar emulsion is the most intractable of those with which we have to deal, it is fairly safe to assume that its satisfactory separation by centrifugal force will ensure success with the other less obstinate mixtures.

Centrifugal separators date from 1850, and the continuous type from 1878; the modern machine running at 6000 r.p.m. Though it has been authoritatively stated that the separation of water-gas tar into water and oil containing less than 5 p.ct. of water, was impossible of attainment other than by distillation until the introduction of the super-centrifuge in 1915, this cannot be reconciled with the fact that separation to this degree was obtained by a German centrifuge in 1908. This machine—the Burmeister and Wain—treated tar at a cost of 0·1d. per gallon; the treatment resulting in an increase in price of from 0·3d. to 0·6d. per gallon. In 1912 this plant was, according to reports, reducing the water content of water-gas tar to 0·5 p.ct., and sometimes *nil*. A communication also stated that the problem of carburetted water-gas tar can be solved completely by the use of the centrifuge; the tar being separated into one containing no water, into clear water, and a thick clayey black mass which can be carbonized in the ordinary retorts, leaving behind coke.

The ordinary type of De Laval cream separator is useless for water-gas tar separation, as in a very few minutes the intermediate spaces between the conical parts are filled-up with the thick clayey black mass. The Burmeister and Wain machine has not so far been employed in England, where during the last three years the super-centrifuge has been successfully applied.

The Burmeister and Wain apparatus externally appears somewhat similar to the centrifugal dryer used for sulphate of ammonia, but with the perforated casing replaced by solid sheet metal. The drum revolves at about 2400 r.p.m., and the tar is admitted at the bottom and pushed upwards by the continually entering emulsion. As soon as the liquid starts to separate, the solids cling closely to the inner surface, with the tar layer sandwiched between the solids and the water layer. A steel ring constitutes the dividing plate, and is attached concentrically to the top of the drum, with its outer edge a few millimetres from the interior surface of the drum. The tar rising up the side passes the outer edge of the ring, and appears on top, while the line of division is baffled. By adjustable spouts, the tar is taken from above, and the water from below, the dividing plate.

If separation is not effected, it is because either the line of division is not baffled by the ring or the bowl has become full of solids, with the consequent obstruction of the annular space. It is reported that under normal working conditions the machine had a throughput of 70 gallons per hour of emulsion preheated to 70° to 80° C., and containing 2·6 p.ct. of solids and 20 p.ct. of water. This solid content necessitated cleaning the bowl after five hours' working, or when it contained about 90 lbs. of solids.

The Sharples Super-Centrifuge.

The machine recently introduced in England is known as the Sharples super-centrifuge. In this apparatus the only difference in principle from the one just explained is that the adjustable spout for removing the tar is replaced by one of a series of rings of varying internal diameter; the correct ring being the one which causes the separation line to be baffled by the dividing plate. In order to subject the liquid to greater centrifugal force, the speed of the bowl is increased to 17,000 r.p.m., while to ensure safety from disintegration of the bowl at this high speed, and to economize in space, the bowl is reduced in diameter to 4½ in. These conditions produce a force more than 17,000 times that of gravity. To prevent slip between the bowl and the contained liquid there is a three-winged device which can be withdrawn during cleaning. The bowl is directly coupled to a single-impulse radial-flow turbine, which runs on a ball bearing; this being the only bearing in the machine.

The emulsion, preheated to 85° C. by open steam, which also stirs it up and keeps the quality constant, is injected at the bottom, at a pressure of about 3 lbs., this usually being given by the head from a feed tank. Under normal conditions, a throughput of 134 gallons per hour has been obtained. This emulsion has contained 46 p.ct. water and a solid content of 0·85 p.ct. This solid content entails cleaning the bowl after one hour's working; but as two bowls are always provided, one is being cleaned while the other is working, and so no time is lost. It is stated that the final tar has always under 1¼ p.ct. water, and that treatment should cost little more than ¼d. per gallon for steam, labour, and maintenance. A lower water content in the crude emulsion will mean lower running costs per gallon of final tar.

Whether or not it is profitable so to treat the water-gas tar emulsion, depends on the uses to which the final product may be put; and it might be of interest to note that this tar has been successfully employed for extracting naphthalene from coal gas, for preventing weeds on railroad tracts (with one application every two years at the rate of 3000 gallons per mile), for preserving timber (in this case the antiseptic properties of coal tar, although helpful, not being essential), for Diesel engines, for tarring fish-nets (for which purpose it is said to have no equal), and for boiler firing. However, even with these and other uses, the competitive price of alternative oils may not permit of profitable treatment of the water-gas tar; and it would therefore not be out of place to investigate the formation of tar-oil emulsions, with a view to devising some means of preventing their appearance or making them less obstinate.

An emulsion may consist of water dispersed as small globules in oil or the oil dispersed in water. The type of emulsion depends on the solids or liquid causing the emulsion. As a result of tests by the electrical conductivity method and the drop dispersion method, I have concluded that tar-oil emulsions are always of the kind in which water is dispersed in oil. The modern theory of emulsions is that solid agents effecting the emulsification do not form the nuclei of the water globules, as is often supposed, but are found adsorbed into the film between the oil and water; and if the solid is more easily wetted by oil than by water, it promotes an emulsion of water in oil. Free carbon is a solid having these characteristics.

That the solids which are removed by centrifuging are the cause of emulsification can be proved by trying to emulsify the tar and the water as they come from the centrifuge; then, owing to the absence of the solids, no stable emulsion can be formed. It would therefore seem unnecessary to centrifuge the emulsion longer than is needed just to remove the solids, allowing the remaining water in the hot tar to separate out by gravity. Such is the case; and I have obtained a perfectly dry tar from a mixture containing 5 p.ct. of water by allowing it to stand for one day.

As these solids are the cause of emulsification, why do we not have coal-tar emulsions of even greater intractability? Vertical tars containing 8 to 14 p.ct. of free carbon, and horizontal tars with even 16 to 20 p.ct., both separate very easily to a tar with under 5 p.ct. of water—always providing, of course, that proper treatment is given to them on their way to the storage wells. It is because solid emulsifiers only form emulsions when they are present in quantities varying between certain limits; and in the case of straight vertical or horizontal tar the maximum limit is exceeded. In support of this, it is interesting to note that a method of estimating water in tar, given by the American Bureau of Mines, consists of mixing carbon black with the tar, when the water will separate out and may be poured off.

Therefore we ought to be able to prevent emulsions giving trouble, by increasing their free-carbon content, and thus "break

ing" them. To achieve this, the water-gas tar can be used for hot washing of coal gas (incidentally extracting some naphthalene) or, perhaps better still, by using it in place of water in the seals of the water-gas plant, when apparently a process of distillation will take place, with the consequent lowering of the water content. These phenomena are not, however, the result of distillation, but of a concentration of the free carbon.

Discussion.

The PRESIDENT (Mr. Walter Grogono) remarked that the alterations that had taken place in the methods of carbonizing were producing tars which were very hard to separate from water, and this paper would therefore prove of great interest to all engaged on the works. One of the great problems at Fulham was to separate the water from the tar. The author had said a good deal with which, from his own personal experience, he found himself unable to agree. They were troubled at Fulham with tar which had in it anything up to 25 p.ct. of free carbon, and so far they had not found any means of separating this tar. They had tried different methods of heating and of taking away from the horizontal retorts, and now they had come down to the centrifuge, which would not separate it. So far as water-gas tar was concerned, they had no difficulty. Had the author had any experience of separating water from coal-gas tars? Mr. Prater said that by adding to the free-carbon content the separation should be easier. Those works of his Company where they had inclined or vertical retort tar mixed with their horizontal tar were able to get separation, but with horizontal tar only at Fulham they would be very glad of some hints as to how to do it.

Mr. D. CLEAVE CROSS (Lea Bridge) said the President had appealed for hints as to how to separate his tar. Let him mix his horizontal tar with the tar from the new Glover-West vertical retorts, and then he would do it. Since they had had their verticals in operation at Lea Bridge, they had had no trouble in getting down below 5 p.ct., except when their storage tank got rather low. They put the whole of the tar and liquor into a large storage tank, and always kept a head of liquor something over 8 or 9 ft. He had been advised to go to Tottenham and see this machine, which he was told was going to be a great boon. If they did get the percentage of water down to 1½, it should be possible to obtain 1d. or 2d. per gallon more.

Mr. LEONARD LACEY (Gas Light and Coke Company) pointed out that with reference to the Sharples centrifuge, the author said under normal conditions a throughput of 134 gallons per hour had been obtained. This, of course, was a relatively small quantity per hour to treat. Was it possible to get a machine that would deal with a larger amount, or would it be necessary to duplicate the machine?

Mr. PRATER: It would be necessary to duplicate the machine, but this would not entail any more labour.

Mr. W. NEWTON BOOTH (Woolwich Arsenal) remarked that the question of the working of emulsions was very interesting from the scientific point of view. He was now ready on his own works for starting-up a centrifugal separator, and he was just wondering, after hearing this paper, what was going to happen. He would like to ask how, when the tar had been treated in the centrifugal machine, and one had got out of it practically the whole of the solid matter, and it was used for the preparation of Road Board tar, it filled the specification in respect of free carbon. What did the author mean by a perfectly dry tar from a mixture containing 5 p.ct. of water? In his own experience of tar oils, they were capable of holding in pure solution something approaching 2 p.ct. of water, and he took it no centrifuge would break down such a condition.

Mr. PRATER replied that he had had no experience with water-gas tar in connection with the Road Board specification, but he doubted very much whether it would be possible to come up to it, because of the free carbon which was extracted. Referring to the perfectly dry tar from a mixture containing 5 p.ct. of water, this was arrived at by the distillation test, and up to 170° there was not one spot of water.

Mr. BOOTH: It is a remarkable result, because if you buy any commercial tar oil, you will find it contains water.

The PRESIDENT said he entirely agreed with Mr. Cross. His Company had found, where they had vertical retorts, or even inclined retorts, operating on the same works with horizontals, there was no trouble at all in the separation; but they had also found that in one works where there were only horizontals, the tar was always under 5 p.ct. without any treatment. In the latter case, the tar "lived" on the works in very large tanks, 30 ft. deep, and each capable of storing half-a-million gallons. The tar was pumped from these tanks into an above-ground loading tank about 30 ft. high, and the barges were loaded from this. With a make of over 70 therms, they still had no trouble in separation, whereas at other works they had had to warm the tar up to get separation. At Fulham, their tank was not so deep, but it was 5000 gallons to the inch. The tar from the bottom, which might have been, some of it, there six months, would contain from 14 to 15 p.ct. of water, and it would not separate. He hoped as the author got more and more experience of this machine the Association would hear further particulars about it.

Keeping Faith with the Gas Industry.

Writing in the American Gas Association "Monthly," Mr. C. B. Babcock points out that the best fuel known for both domestic and industrial uses is gas. Through more than a century of use and abuse gas has demonstrated its great efficiency, and by sheer merit has won recognition as a completely satisfactory fuel when consumed by means of the right equipment. The average price of gas in the United States and Canada is, he says, now so low that from an economy standpoint there can be no valid objection to its use. From a utility point of view, the development of practical gas appliances has raised the efficiency of gas to a point unapproached by any other fuel; but much of this efficiency is conditional upon the use of good quality appliances. Manufacturers and dealers who sell any but the best are not keeping faith with their customers, or with the gas industry.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Low-Temperature Fuel Treatment in Gas-Works.

SIR,—I have read the letter from Mr. S. Moore dated March 29, which appeared in the "JOURNAL" for April 2, regarding my article entitled "Low-Temperature Fuel Treatment in Gas-Works," and gather that his suggestion is that someone is depriving the inventor of the fruits of his labour. I am sorry to read this, as I thought that I had dealt with strict impartiality as to the part which both Mr. Moore and Messrs. Ashmore, Benson, Pease, & Co., Ltd., had taken in the development of the system *to the stage at which it has now arrived*, as exemplified by the Scunthorpe plant.

In stating the history of the Scunthorpe plant, I have been anxious to be scrupulously fair both to Mr. Moore in his pioneer work, and to Messrs. Ashmore, Benson, Pease, & Co., Ltd., who carried the system to the practical and commercial stage to which it has now been brought entirely by their own labours and research in the two years since Mr. Moore severed his connection with the Council. During that time, Messrs. Ashmore, Benson, Pease, & Co., Ltd., have not had the advantage of any assistance from Mr. Moore.

In my opinion, the measure of success which has attended the plant at Scunthorpe is due more to the methods of operation which have been adopted than to the particular design employed, which, as I have mentioned, differed from that of Mr. Moore. It is only fair to Messrs. Ashmore, Benson, Pease, & Co., Ltd, to state that they, and not Mr. Moore, took all the responsibility and gave performance guarantees for the plant to the Scunthorpe Urban District Council.

I am interested to learn of the numerous supplementary patents and provisional protections which Mr. Moore mentions. The fact of his having such protection, considered in the light of the fact that the plant which Messrs. Ashmore, Benson, Pease, & Co., Ltd., have to offer embodies no patent of Mr. Moore's, should, I think, relieve him of any apprehensions he may have on the score of deprivation of the fruits of his labour.

N. E. RAMBUSH.

Ivy Bank, West Villas,
Stockton-on-Tees,
April 7, 1924.

Assessment where a Gas Undertaking Purchases in Bulk.

SIR,—A gas undertaking which is not manufacturing gas receives its supply in bulk from a manufacturing centre elsewhere, and has no manufacturing plant of any description. Notwithstanding this, the assessor proposes to assess the value on the usual revenue basis (which assumes manufacturing conditions). Is there any similar state of circumstances in other parts of the country; and, if so, what is the practice followed as regards valuation?

SCRUTATOR.

April 3, 1924.

[The fact of gas undertakings buying gas in bulk and distributing would not affect the basis for ascertaining the letting value of such an undertaking. The revenue basis, which is the principle usually adopted in arriving at the letting value of this class of undertaking, does not necessarily assume manufacturing conditions. There are similar undertakings taking bulk supplies throughout the country, and the practice followed is exactly the same as for a manufacturing concern. It is quite clear there cannot be any difference in the practice whether an undertaking manufactures or takes a bulk supply.—ED. "G. J."]

The Story of Coal: A Correction.

SIR,—In the advertisement "The Story of Coal No. 7 (The Owners' Offer to the Miners)," which appears in your current issue, there is an incorrect statement in the second paragraph, relating to the lowest paid men.

The statement reads: "They (the owners) have offered an increase in their minimum wage of two-fifths, and an increase in their subsistence wage of one-eighth." The sentence should read: "They have offered an increase in their minimum wage to 40 p.ct. (two fifths on the standard, and an increase in their subsistence wage of one-eighth."

PHILIP GEE.

40, *King Street, Covent Garden, W.C.2, April 5, 1924.*

Gas-Cookers and Cooking.

SIR,—When the Birmingham Gas Exhibition was being held, I suggested a competition of all the cookers on show on certain definite lines. There may have been at the time very good reasons for the gas industry not interesting itself in the suggestion.

The present position is something like this:

1. There are over four million gas-cookers with hotplates in use which are costing the consumers something like twice the money they need cost for the service obtained.
2. These existing cookers all require to be remodelled or exchanged so that the consumer may obtain the present service from them at something like 50 p.ct. less cost.
3. The above facts are accepted as correct in most quarters, because orders have been placed by many large gas undertakings for hotplates (at least less obsolete) in quantities of 5000 and over, to replace those most obsolete.

Now the proposal I wish to make is that the gas industry itself, through one or other of its representative bodies, should hold an inquiry—public, if at all possible—into the service that gas cookers (hot-

plates and ovens) on the market are giving. Some such inquiry is all the more necessary when we read some of the claims and statements made in various lectures, speeches, and advertisements. The reason for my suggestion is that, without such an inquiry, there will be a second scrapping of the obsolete, following on the heels of the first.

The best cookers on the market which are being adopted as the "modern" cooker embody various principles, correct or otherwise; and these vary in the service obtained from them by something like 25 p.ct., and more. Such a variation is far too great, and means that so soon as the consumers realize that their "new" cooker is still very much behind the best, there will be trouble; and a second scrapping, with all its cost and trouble, will have to take place. I submit that the time has arrived when the principles concerned in burner and cooker construction require to be agreed on and adopted. The work of the Committee on Cooker Construction was excellent, but it does not follow that this work has carried the industry to a final stage, even for the time being. The particular manner in which agreed principles are applied is a matter of secondary importance.

If the industry does not make the inquiry itself, for its own benefit, the public will sooner or later call for a Government inquiry. The latter could not undertake the duty nearly so well as the industry itself. Further, it would be a reflection on an industry which professes, through the British Commercial Gas Association and all its many associations, to be out to give gas consumers the best service at the least cost.

There is another aspect of the position. The competition with gas is not confined to that of electricity, though the latter is being sold at 1d. per unit, and less, for cooking. Oil for power is already beating us, and oil for cooking is in the offing. I do not refer alone, in the case of cooking, to oil burners and ovens as at present advertised. Immense improvements can be made on this type of oil burner and oven. Further, there are improved coal ovens on the market, which are most economical in use.

The gas industry need fear none of these things if gas is supplied of suitable quality and pressure to really first-class gas-cookers. Once, however, allow households to adopt oil, or improved coal ranges, and the work for the gas industry to replace such with gas will border on the impossible. Now is the time!

GEO. HELPS.

The Nuneaton Gas Company, Queen's Road, Nuneaton, April 7, 1924.

REGISTER OF PATENTS.

Purification of Gases.—No. 190,131.

THE KOPPERS COMPANY, of Pennsylvania.

No. 32,387; Nov. 27, 1922. Convention date, Dec. 8, 1921.

A series of patents relating to the purification of gases was noticed in the "JOURNAL" for Feb. 6, p. 318; and this invention is a further modification, and relates to the removal of hydrogen sulphide, hydrocyanic acid, &c., from gas, by an alkali absorbent which can be revivified and returned to the gas purification stage of the process. According to this invention, the gases are treated in a single chamber by the absorbent liquid. The latter is then transferred to another chamber, where it is brought into contact with an iron suspension which removes the sulphur from the alkali, with the formation of iron sulphide. The fouled alkaline liquid is intimately mingled with the iron suspension by agitation, and the resulting sludge continuously separated into clear alkali solution and a heavy iron sludge, which latter is regenerated by aeration and returned to the process. Substantially all the absorbed sulphur is extracted in a solid form, whereby the escape of fumes into the atmosphere in the vicinity of the gas-purifying plant is avoided. The complete apparatus is described and illustrated in the specification.

No. 212,201.

No. 27,677, of Nov. 27, 1922.

This invention is a suggested improvement of the foregoing, and aims at a simplification of the process. The only modification is the omission of the step of aerating the iron sulphide. The operation is continued until the iron-sulphide sludge is no longer able satisfactorily to regenerate the fouled alkaline liquor, owing to the accumulation of sulphur. The thick sludge can be discarded or regenerated in any desired manner. The best concentration of the sodium-carbonate solution, state the patentees, is about 5 p.ct.

Regenerative Furnaces.—No. 211,267.

DOBSON, A., and SUGDEN & CO., LTD., both of Leeds.

No. 32,926; Dec. 2, 1922.

This specification describes and illustrates an arrangement for the regenerator in a horizontal retort setting.

The patentees state that the usual practice in this type of furnace is to arrange the waste-gas outlet toward the base of the apparatus and to pass the incoming air over the outlet channel. The waste products have generally been caused to take a somewhat baffled and lengthy course through channels connected at either end by vertical flues with or without baffles or stops. Air channels have been formed over or adjacent to the waste-product channels, such air channels communicating with the combustion chamber. It has also been proposed to lead the products down through vertical tubes, horizontal tubes, and other vertical tubes out of alignment with the first and so on, and to form passages for air, also baffled, arranged near to, but not entirely round, the products tubes.

The invention consists in constructing and arranging waste-product channels which are interconnected one with another, and air passages which practically surround such channels on four sides and finally communicate with the combustion chamber; the vertical interconnecting product channels being in alignment in respect of each series or row. One at least of the usual vertical flues is discarded, leaving only one main down-take communicating with one or a series of horizontal product channels.

It is claimed that by this construction there is obtained an increased efficiency of the apparatus as a whole without increase in size as compared with existing plants of a similar character.

Waste-Heat Boilers.—No. 211,537.

KIRKE, P. ST. G., of Victoria Street, S.W. 1.

No. 29,068; Oct. 25, 1922.

The complete specification of this patent is given practically *in extenso*, explaining very lucidly, as it does, many important modifications which are covered by it.

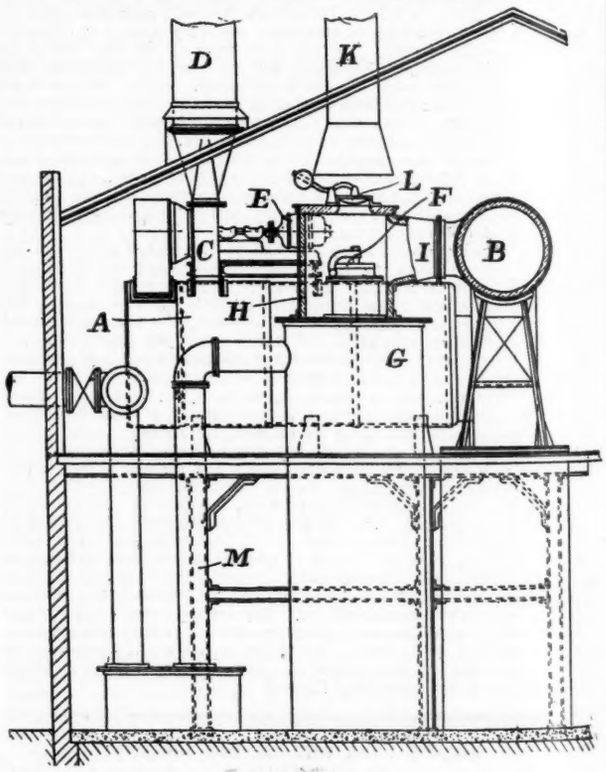
The invention relates to the recovery of waste heat from water-gas plants of various types, and has for its object to recover such heat efficiently with the least (if any) disturbance of the water-gas plants and their valves, and with the minimum capital expenditure.

It is usual to pass both the blow-gas and the gas run from a generator through a waste-heat boiler. The steam so generated is very variable in quantity, as that available during the blow is many times that available during the run. If now the blow-gas alone is passed through the boiler, while the run-gas is dealt with in the usual way, the generation of steam in the boiler becomes even more intermittent—in some cases limited to 2 minutes out of 8, in others to 2 minutes out of every 5, and so on.

By this invention the patentee combines two or more generators, operated in succession, with a waste-heat boiler and means whereby the hot blow-gas from each generator in succession is caused to pass through the boiler, preferably by suction. In this manner it becomes possible to generate steam more continuously. A suitable boiler for the purpose was described in specification No. 140,851. The blow-gas is drawn through at a high mean velocity.

It is usual for the products of the blow to be discharged into a chimney fitted with a cowl at the bottom to collect them and conduct them to the outside of the house. It is not usual to take any precaution to prevent air being entrained with this blow-gas and carried therewith up the chimney, and in one form of this invention the cowl is extended by a skirt or otherwise so as to limit to a minimum the amount of air entrained into the blow-gas, or to an amount sufficient for burning any unburnt products in the gas.

Preferably, the pressure of the gases in the flue leading to the boiler should be approximately that of the atmosphere; the resistance of the boiler being overcome by negative draught at the outlet end of



The Kirke Boiler.

the boiler. In any case there may be fitted in, or at the outlet of, the usual chimney on the generator a damper or the like which may be loaded or balanced in any suitable way. Surplus gas, if any, which cannot be handled by the boiler, may then easily escape to the atmosphere; but cold air from the atmosphere is prevented from leaking backwards through this valve into the products passing to the boiler. Should the operation of the generators get out of step, so that there is an overlapping and two of them discharge products simultaneously, the operation of the steam generators is not interfered with, as surplus gases can escape to the atmosphere—if desired, through a feed-water heater. The like would happen if the draught through the boiler were impaired for any reason. On the other hand, in the absence of suffi-

cient hot gases to enable the boiler to be worked at full load during a portion of each cycle, the draught on the outlet of the boiler need not be regulated, since the damper will prevent ingress of air.

To enable the present stack valves to be adjusted, and in some cases to enable fuel to be put into the plant through them, suitable doors may be provided in the casing near them.

Since the blow-gas alone is passed through the boiler, the sensible heat in the run-gas may be used for superheating the steam generated through the blow, or otherwise, or for heating feed water for the waste-heat or other boiler.

When the boiler works on negative draught, auxiliary fuel firing of the boiler may be practised by the addition of a suitable combustion chamber, the products of the blow being introduced preferably at a point between the combustion chamber and the boiler. As a considerable negative pressure may be created in the inlet chamber of the boiler during the run, or when no products from a blow are available, the combustion chamber fire-door should be fitted with an air-tight closure; and air for combustion of the fuel should also be rendered controllable by a suitable damper. If forced draught is used for the boiler as a waste-heat boiler, it will also be required for fuel firing. In this case a closed stoke-hole could be used.

As the blow products contain unburnt gases, the amount of which usually varies during the blow, provision may be made for admitting air in an adjustable manner (it may be in a varying manner to suit the quantity of unburnt products) for combustion of these gases. Atmospheric air may be used for negative draught, and air blast for positive draught. A suitable place for such combustion is in a brick-lined flue conducting the products to the boiler. This air inlet may be open and closed by the same lever as that which opens and closes the stack valve.

As the water gas generated does not pass through the boiler (but may or may not go to a feed-water heater or air heater), the present invention is highly suitable for carburetted water-gas plants.

It will be seen that in the case of 4 water-gas generators having 2 minutes' blow and 6 minutes' run, a single boiler, by taking the products from the blow of each in succession, would be running continuously; with 3 plants it would be running 75 p.ct. of the time; and with 2 plants, 50 p.ct. of the time—saving the cost of 3 boilers, 2 boilers, and 1 boiler in the respective cases. In cases where the blow was 2 minutes and the run 5 minutes, occasionally the blow from two plants would partly overlap and endeavour to discharge to the boiler simultaneously. As a boiler designed for the products from one plant would not handle those from two simultaneously, unless the draught-drop through it were quadrupled, the surplus or any portion thereof may automatically escape through the non-return valve at the top of the chimney or elsewhere to the atmosphere.

Of the three drawings which accompany the specification, we reproduce a sectional side elevation.

A is a waste-heat boiler of the fire-tube type through which the blow-gas is drawn from the collecting flue B by means of a fan C, which delivers it to the chimney D, and is driven by a motor E. The usual stack valve F of each generator G is enclosed by a casing H communicating by a connecting piece I with the collecting flue B. In the top of the casing H, co-axial with the chimney K, is a balanced non-return valve L.

During the blow the valve F is open and the producer gas passes into the flue B, which is brick-lined and into which air is admitted through an adjustable valve (not shown) to burn the combustible constituents of the blow-gas. The speed of the fan C is adjusted to keep the pressure in the collecting flue slightly below that of the atmosphere.

In the case illustrated, the single boiler is of dimensions adapted to deal with the blow-gas of only one generator, this being possible because the blow periods of the three generators occur in succession and are together equal in duration to the run periods of two generators taken together. Should this normal state of affairs be disturbed, the balanced valve L of one or more of the generators will either open to permit escape of gas with which the boiler cannot deal, or remain closed to prevent intake of cold air under section of the fan C. During the run of a generator the valve F is closed and the water gas passes away as usual through the pipe M.

Check Valve for Gas-Fires.—No. 211,673.

ENDERSEN, J., of Limerick.

No. 2981; Feb. 1, 1923.

This invention is for a device applicable to the bunsen burner of gas-fires, &c.; the object being to prevent escape of gas in the event of the tap being left open when the gas supply fails at the meter or elsewhere.

The principal components of the device are a spring-pressed check valve between the tap and the burner, and an expansible rod supported close to the burner orifices. The two are interconnected by a lever. To light the burner, one presses the lever and holds open the valve until the rod has been expanded sufficiently by the heat to hold the lever. If the supply fails for any reason, contraction takes place, and the spring closes the check valve.

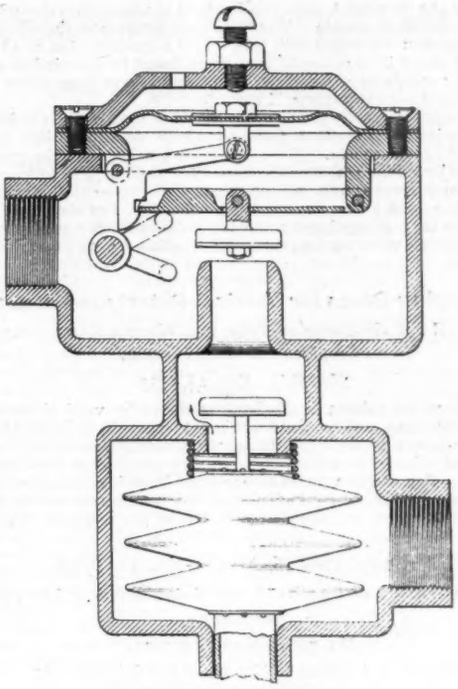
Safety Cut-Off Valve.—No. 211,590.

RADIATION, LTD., and TWIGG, W. R., both of Luton.

No. 32,297; Nov. 25, 1922.

This invention relates to a safety cut-off gas valve controlled by a diaphragm sustained by the pressure of the gas. A modification of the valve makes the closure of the gas supply take place in the event of a flow of water failing as well as in the event of the gas supply failing; and this form is, of course, particularly applicable to geysers.

We reproduce a sectional elevation of the latter form. It will be observed that the lower of two valves is held open normally through the medium of a concertina diaphragm, while the upper valve is sustained by a leather diaphragm connected to it by a notched bell-crank and supporting arm. The action is obvious. In the event of the water supply failing, the concertina diaphragm is compressed by a spring, and the gas supply is shut off without the upper valve being effected. If, on the other hand, the gas supply fails, the leather diaphragm collapses and releases the upper valve on to its seat.



Twigg's Cut-Off Valve.

In the latter event, before the gas appliance can be put to work again, the upper valve must be reset by means of a finger piece attached to a spindle (passing through a gland) to which is attached a lever.

For apparatus other than geysers, the gas inlet is situated close under the upper chamber, and the water control extension is, of course, omitted.

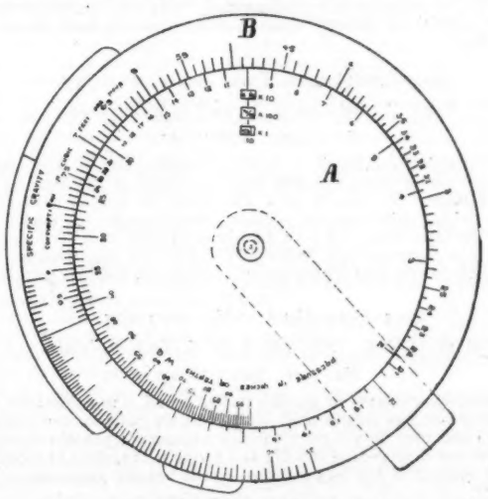
Calculating Device.—No. 211,669.

FORSHAW, A., of Alvanley (near Helsby).

No. 2374; Jan. 26, 1923.

This invention is for a calculator for use in determining the consumption of gas in correlation with variables such as the specific gravity, orifice size and coefficient, and pressure. Concentric rotating scales are employed, the second one being rigidly connected to an index member or pointer at the back of the "slide-rule." The first member is apertured so as to reveal the various readings given by the second.

We reproduce a view of the assembled calculator, and one of the examples of calculation given by the patentee.



Forshaw's Consumption Calculator.

What size of drilling will give 4·85 c.ft. per hour at 1-in. pressure?

In the absence of further information, the specific gravity and orifice coefficient are taken to be 0·5 and 0·75 respectively (assuming that coal gas is being considered). Rotate the projection of the intermediate scale member until the index mark is opposite to 0·5 on the specific gravity scale. The calculator reads directly for an orifice coefficient of value 0·75.

Rotate the member A until the figure 10 is opposite to the 4·85 mark on the consumption scale. The number appearing in the window X 1 (53) is the required morse drill size. Had a consumption of 48·5 been specified, the drill size would have been found in the window marked X 10 ($\frac{5}{16}$); similarly 485 c.ft. per hour would have been given by the drill indicated in the window X 100 ($\frac{9}{32}$).

If the specific gravity is known to be other than 0·5, the index mark on the projection is made to correspond with the appropriate mark on the specific gravity scale. When this mark has been set, the calculator may be adjusted for orifice coefficients other than 0·75 as follows: The radial arm or loose pointer mounted behind the three circular members is set to the mark 7·5 on the consumption scale. The arm and the projection are then gripped and rotated together until the arm is opposite the appropriate value on the consumption scale—*i.e.*, 10 times the orifice coefficient.

Discharging Doors for Vertical Retorts.—No. 211,710.

DIXON, J. E., of Newcastle-on-Tyne, and WEST'S GAS IMPROVEMENT CO., LTD., of Miles Platting.

No. 5882; Feb. 28, 1923.

This invention relates to discharging doors for vertical retorts and for other services, and has for its object to provide an improved form and arrangement of door and its operating mechanism which shall be simple and efficient in action and ensure a good joint when the door is closed. The mechanism is of the type in which the movement of the actuating handle or equivalent part first withdraws the door from contact with its seat and then turns it clear of the discharge opening.

Prepayment Meters.—No. 211,723.

M'INTYRE, J., of Portobello, and MILNE AND SON, LTD., of Edinburgh.

No. 7479; March 15, 1923.

Patent of Addition to No. 205,596 of July 27, 1922.

The parent patent was briefly noted on p. 586 of the "JOURNAL" for Nov. 28 last. The patentees now claim that "at any desired point during the rotation of a hand-operated toothed wheel, the teeth mesh with another toothed wheel (rotating same) through a coin engaging with a pin, which can travel in two grooves, fitted with stops and having a gate so that the pin can pass through from one groove to the other, while being rotated by means of a hand-operated camplate."

Lighting Burners.—No. 211,733.

FRICKER, E. H., of Exeter.

No. 8919; March 29, 1923.

This invention relates to the type of burner in which a coiled spring is employed to assist in mixing the gas and air on their way to the burner head and to regulate their volume by variable compression of the coils.

According to the present invention, the spring is mounted or housed in a cage or skeleton carrier member which is open at one end and provided with a closure plate or member at the other. This closure plate or member serves also as the means for adjusting the spring.

Gas Manufacture.—No. 211,748.

TRAVERS, M. W., of Aldwych, W.C. 2, and CLARK, F. W., of Lymm.

No. 10,879; April 21, 1923.

In the two-stage manufacture of gas from coal, the patentees claim "passing the permanent gas and water vapour produced from the coal during the blow period to a condenser, drawing off the permanent gas from the condenser through a gauge, and delivering such gas to the gasholder."

Gas Cocks and Taps.—No. 211,797.

PAGE, E., and LEE, T. J., both of Birmingham.

No. 20,059; Aug. 7, 1923.

This invention relates to a detail of construction of the type of fitting in which a chain-actuated arm is secured to the plug outside the cock body. It consists in a substitute for kniting pins or for washers with projections for engaging shoulders on the cock body. Briefly, the lever is formed with two integral ears bent over so as to project into corresponding recessed parts in the plug casing; thus providing a double stop for movement of the lever in either direction.

Gas-Fire Fuel.—No. 212,375.

MAIN, R. & A., LTD., and AIRD, K., both of Falkirk.

No. 3921; Feb. 9, 1923.

This invention relates to gas-fire fuel of small size—about the size of a walnut—and generally used with ordinary radiants by laying it on top so that they do not get wholly incandescent; thereby breaking up the intense brilliance of the fire and giving it the effect of a coal or coke fire without in any way diminishing the heating properties of the fire.

The object of the invention is to connect a number of these pieces together or in sections so that they can be employed without fear of their being disturbed. In simple form, each piece of fuel is provided with a hole and the desired number are strung on a wire. Alternatively, the pieces of fuel may be threaded on to a skeleton frame like wire netting and form a sheet of fuel; or a single length may be coiled or waved to form a single sheet. In some cases each piece may be provided with a wire having projecting hook or loop portions, and these connected together to form a sheet of fuel.

Gas-Switch.—No. 211,937.

KENT-JOHNSTON, A. G., of Old Broad Street, E.C.

No. 32,437; Nov. 28, 1922.
No. 14,193; May 30, 1923.

This patent relates to a gas-switch of the type in which gas is admitted to the burner by the action of a solenoid; the gas being ignited by a glowing wire.

Reference to the sections which we reproduce will show that the working parts are assembled round a block, in which gas passages are drilled; the latter, however, only connecting through the medium of a groove in a rotatable circular valve. This valve is moved by one of two projections on the core of the solenoids, which projections engage a pin on the valve.

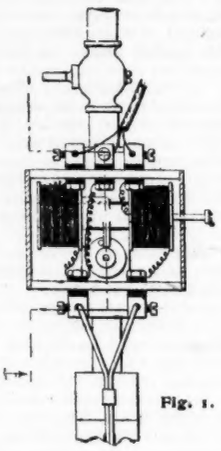


Fig. 1.

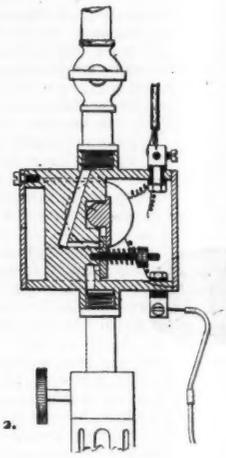


Fig. 2.

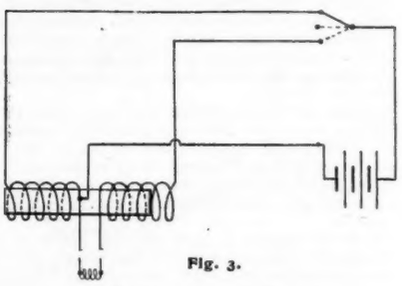


Fig. 3.

Kent-Johnston's Gas-Switch.

The electric connections will be readily understood from the wiring plan which we reproduce—fig. 3. We have omitted the burner head and globe from figs. 1 and 2; and it should be explained that the igniter wires terminate in a short length of platinum wire which is rendered incandescent by the current.

Coin-Freed Meters.—No. 212,130.

GLOVER, THOS., & CO., LTD., and GLOVER, W. R., both of Edmonton, N. 18.

No. 8187; March 22, 1923.

This invention relates to the class of coin-freed gas-meter employed in rooms and other places (hotel bedrooms, say) and receiving their supplies from an ordinary meter.

The object of the invention is to introduce mechanism in such meters between the bellows or other operative mechanism and the coin-freed mechanism whereby the operative and the coin-freed mechanisms can be detached, and the coin-freed mechanism reversed to zero and the valve closed prior to reworking.

To effect this, the patentees claim: A toothed wheel on the shaft of the worm which acts to close the valve, a shaft at right angles thereto and carrying a worm mesbing with the toothed wheel aforesaid, a pinion on said right-angled shaft meshing with a wheel on a pinion shaft; the latter carries a wheel, meshing with a pinion on a stub shaft which carries a wheel meshing with the worm operated by the bellows or operative mechanism; a spring-controlled catch for engaging the right-angled shaft to hold its worm in or out of contact with the toothed wheel on the valve operating worm shaft; a spring controlled ratchet wheel in connection with the right-angled shaft; a cover to enclose the catch; and means for locking the cover.

Gas Producers.—No. 212,302.

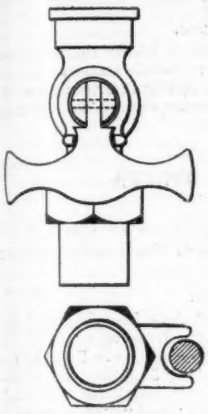
GILL, G. M., of Blackheath, S.E. 3.

No. 33,341; Dec. 6, 1922.

According to this invention, in the operation of gas producers or other generators having a deep bed of fuel, water is introduced in a fine state of division through suitable nozzles situated in the ash-pit so as to spray directly on the furnace bars and on the heated fuel at the base of the producer. The water thus introduced is converted into steam by the heat of the furnace bars and of the bed of fuel, cooling

the bars and also the doors used for cleaning the furnaces. The sprays may be attached to the furnace doors by flexible pipes which allow the doors to be readily opened and shut. More than one nozzle may be used, if necessary, in order to distribute the spray over the whole surface of the grate bars.

The steam formed in this manner can be utilized in the generation of hydrogen and carbon monoxide, and the pressure applied to the spraying nozzles is preferably such that the water supplied corresponds to the amount of steam necessary to generate the maximum quantity of hydrogen to be added to the gases produced.



A Parkinson Plug Cock.

Gas-Taps.—No. 212,131.

Gibb, D. M'C., and The Parkinson Stove Co., Ltd., both of Stechford.

No. 8232; March 22, 1923.

This invention relates to taps or cocks of the rotatable plug type as used for controlling the supply of gas to cookers, fires, &c.; the object being to provide an improved tap which becomes automatically locked when moved to the closed position. The tap is of the type in which there is combined with the rotatable plug a hinged finger-piece adapted to engage notches formed directly on the body part.

The invention comprises the provision on the body of an integral projecting crutch with which the stem of the finger-piece can engage.

Flashing Apparatus.—No. 211,941.

Hall, W., of Kearsley.

No. 32,453; Nov. 28, 1922.

This specification describes a device for admitting gas automatically and intermittently to a burner. The device is of the type which employs a bell sealed in oil. A vertical pipe admits the gas to a chamber which contains glycerine, the level of which is just below the inlet. An inverted bell floats in the glycerine, and bears a small pipe open at each end; the lower end dipping into the glycerine, the upper end opening above the bell. The parts are so dimensioned that the rising of the bell (due to pressure of the gas admitted) soon lifts the small pipe clear of the oil, and permits the gas to flow to the burner. The pressure being thus released, the bell sinks again, and the process is repeated.

Gas-Cookers.—No. 212,400.

Radiation, Ltd., and Yates, H. J., both of Birmingham.

No. 5572; Feb. 26, 1923.

The patentees point out that, for the burner of a gas-oven, it is usual to permit secondary air to enter the lower end of the oven. It has been proposed to provide a passage for secondary air by partially enclosing the burner tube by a baffle which directs air to the immediate neighbourhood of the flames.

By this patent there is claimed the combination, with the lower side of the burner tube, of a bar or plate forming with the burner tube a secondary-air passage which directs the air to the region of combustion.

The bar or baffle is of curved or flat cross-section, and is placed so as to form with the burner a passage for the secondary air. The upper edge of the bar lies rather below the burner perforations. The baffle may be carried either by the burner tube or by the oven-frame.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 2.]

Nos. 7384 to 8063.

Blaber, J.—"Incandescent gas-burners." No. 7934.
Blakeley, W.—"Gasholders." No. 7531.
Bowerbank, J. W.—"Gas-burners and heating appliances." No. 7575.
Curtis, S. P.—"Carbonization of coal." No. 7502.
Cutler, S.—"Gasholders." No. 7840.
Drab, L.—"Arrangements for closing gas-cocks." No. 7416.
Helko Vertriebs-Ges.—"Insertion piece for gas-ranges, hearths, &c." No. 7756.
Imray, O. Y.—See Curtis, S. P. No. 7502.
King, F. H. W.—"Coin-controlled gas-meters, &c." No. 7655.
Lewis, G. P.—"Gas heating and lighting appliances." No. 7564.
Liggins, J. W.—"Gas-ovens." No. 7777.
Mayrshofer, R.—See Helko Vertriebs-Ges. No. 7756.
Milbourne, R. J.—See Cutler, S. No. 7840.
Mitchell, P. J.—"Methods of burning out accumulations of soot, &c., in gas-mains." No. 7587.
Paddock, E. J.—"Locking-device for cocks, &c." No. 7552.
Power-Gas Corporation, Ltd.—"Production of combustible gases and coke from bituminous fuel." No. 7750.
Ramage, A. S.—"Low-temperature distillation." No. 7483.
Rambush, N. E.—See Power-Gas Corporation, Ltd. No. 7750.
Smith, A.—See Paddock, E. J. No. 7552.
Soc. Chimique de La Grande-Paroisse (Azote et Produits Chimiques).—"Purification of gases." No. 7697.
Sutherland Meter Company, Ltd.—See King, F. H.W. No. 7655.

PARLIAMENTARY INTELLIGENCE.

MARPLE URBAN DISTRICT COUNCIL.

Special Order.

The expectation that some decision might have been come to with regard to the obligations of gas undertakings as to supplying gas for purposes other than lighting or domestic use from mains of insufficient capacity, did not materialize when the draft of the Marple Urban District Council Special Order, under section 10 of the Gas Regulation Act, came before a Select Committee of the House of Commons on Tuesday, April 1. The main purpose of the Order is to transfer the gas undertaking of the Calico Printers' Association, Ltd., authorized by the Compstall Gas Order of 1909, to the Marple Urban District Council by agreement, to repeal the Order of 1909, and to extend the limits of supply of the Council.

The Committee consisted of Mr. D. D. Reid (Chairman), Colonel E. K. Perkins, Mr. T. W. Stamford, and Mr. R. M. Kedward.

By a resolution of the House of Commons on March 4 last, the draft of the Marple Order was referred to the Committee for their report, which, the resolution stipulated, should state whether, in their opinion, the Order should be approved with or without modifications or additions (setting out the modifications or additions, if any, which they proposed), or should not be approved. The resolution also stipulated that opponents to the Order should be heard.

In pursuance of this resolution, objection was raised by the London Midland and Scottish Railway Company, the London and North Eastern Railway Company, the Great Central and Midland Joint Committee, and the Great Central and North Staffordshire Railway Committee.

Sir Henry Courthope Munroe, K.C., who appeared, with Mr. Bidder, for the Railway Companies, said that the objection referred to the following clause in the Order:

> "Notwithstanding anything contained in any enactment to the contrary, the Council shall not be obliged to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of such main is, at the date when the supply is demanded, insufficient for such purpose, or if and so long as any such supply would, in the opinion of the Council, interfere with the sufficiency of the gas required to be supplied by means of that main for lighting or domestic purposes."

The Railway Companies' statement of objection pointed out that the objectors, in connection with their undertaking, had provided—and it would be necessary for them in future to provide and use—gas-engines and other apparatus for purposes other than lighting and domestic use. Under the provisions of the clause the Council could either discontinue an existing supply or refuse to give a new supply solely on the ground that they had not provided mains of sufficient capacity to meet the requirements of the consumers in their district. The effect would be seriously to prejudice the present rights of consumers to a supply of gas. The Railway Companies believed that the nature of the gas now supplied by the Council was such that it did not pass with sufficient freedom along the existing mains of the Council, and submitted that it was for the Council to provide mains of sufficient capacity to comply with their obligations to consumers for all purposes, both as to quality and quantity of gas, and that the Council should not be permitted, merely for the purpose of saving the cost of carrying out their statutory obligations, to seek relief from those obligations. Counsel went on to say that the clause to which objection was raised had since been withdrawn from the Order. The Railway Companies considered this a very important question of principle, and felt that they must take active steps to meet the point. They had been involved in very considerable expense in so doing, though the Order itself did not warrant their spending money on it. On March 26 last the Railway Companies were informed that the Urban District Council had requested the Director of Gas Administration at the Board of Trade to withdraw the clause. The Railway Companies' Parliamentary Agents, in their reply, dated March 29, drew attention to the terms of the resolution of the House of Commons, pointing out that, while the Railway Companies could have no objection to the Order if the clause were deleted, neither the promoters nor the Railway Companies could agree to any alterations, and that an amendment could only be made by Parliament itself upon a report by the Select Committee. Therefore, said Counsel, the objection was not withdrawn.

The Chairman said that the Committee could, with the consent of the Urban District Council, delete the clause.

Counsel questioned whether the mere striking-out of the clause with the consent of the promoters would meet the case, in view of the terms of the resolution of the House.

The Chairman said it would be only a sham fight if the Railway Companies proceeded to make a statement. The Committee were prepared to strike out the clause and to approve the Order. That would meet the terms of reference.

In the course of further discussion, Counsel urged that the facts upon which the House was moved to appoint the Committee, and the position of the Railway Companies, should be stated; but the Chairman said that, as the promoters were not pressing the clause, any statement on behalf of the Railway Companies would be an *ex parte* statement which would not be tested in any way. The Committee were of opinion that it was much better, as this was a point of principle, and had to be fought out later, that the grounds should not be prejudiced in the meantime by a statement on behalf of one of the parties. The Railway Companies in this case were in the unfortunate position of looking for a test case and of having picked a day when their opponents had run away. Any decision to which the Committee might come would be of no value as a precedent.

Mr. H. C. Honey (Director of Gas Administration at the Board of Trade), in reply to the Chairman, said that the Order was one which the Board of Trade proposed to make, after full consideration, and had

submitted it to Parliament for approval. He agreed that if the Committee struck out the clause objected to, and approved the Order, they had fulfilled the terms of their reference.

The decision of the Committee, therefore, was that, with the consent of the Marple Urban District Council, the clause should be struck out; and, subject to that, they approved the Order.

Gas Regulation Act.

On Tuesday of last week, a report from the Select Committee in regard to the Marple Gas Special Order was brought up and read.

LEGAL INTELLIGENCE.

GAS COMPANY'S RECORDS AS EVIDENCE.

A gas bill dispute occupied the lengthy consideration of the Guisborough (Yorks) Justices on Tuesday of last week. The parties were the Brotton Gas Company and Thomas Lord, lessee of the Grand Picture Palace, Brotton, and the trouble had reference to the amount of gas consumed at the latter premises during the December quarter of 1922. The case was heard under the Gas-Works Clauses Act, which provided that, when a difference of the kind arose, the amount might be determined by the magistrates on application by either side.

Mr. H. P. Barugh, on behalf of the Manager of the Gas Company, said the gas was supplied for heating four large radiators in the hall. Lord took over the premises about September, 1922, and at the beginning of the quarter then commencing, the meter reading was 62,000 c.ft. At the end of the quarter the meter registered 154,000 c.ft., showing a consumption during the three months of 72,000 c.ft. When a bill for £22 10s. for payment for this quantity of gas was presented, Lord disputed the amount, and declined to pay. He even refused a collector's invitation to read the meter. No payment having been made, the gas supply to the hall was shortly afterwards cut off. Mr. Barugh added that in fairness to Lord he must explain that at the time the bill was first disputed there was certainly ground for saying that the Gas Company's appliances were not working well. A lot of the meters were very old and were not registering correctly. In no case where new meters had been installed had it been found, however, that the old ones had registered to the prejudice of the consumer.

William Scott, a former collector for the Company, stated that he read the meter at the picture hall for the quarter mentioned. He entered the figures in a notebook, and they were afterwards copied by the late Manager into the Company's books. He did not recollect what the figures were, and had lost the memorandum made at the time.

When the present Manager (Mr. William E. Baxter) produced the Company's forms, with the object of proving the figures which had been given, Mr. R. Nixon, for Lord, objected that such evidence was not admissible. The entries, he said, were merely copies from someone else's book, and were not even the best secondary evidence that might be produced.

Mr. Barugh described the objection as frivolous, and said the Company's books would be accepted as evidence in every court in the kingdom.

Mr. Nixon persisted, however, and added that where a reading was in dispute there was a proper procedure to secure the testing of the meter by an official and impartial expert. Such a course had not been adopted in this case.

The Bench agreed, after more discussion, that the Manager should put in his statement; but they announced later that the evidence was not sufficient to enable them to reach a decision on the matter.

Suggested New Gas-Works for Mossley.

The success of the Mossley gas undertaking during the last few years has brought the Corporation face to face with the problem of making big extensions or building a new works, or, as an alternative, of refusing to accept any further orders for gas for power purposes. The suggestion which is meeting with favour in high official quarters is that of building new works. The Gas Manager, in a statement to the Town Council, said the present works would not be able to cope with the increasing demands of the district, and the Gas Committee would have to decide whether it would be more economical to spend money on extensions or go forward with the erection of new works. The Mayor expressed himself in favour of utilizing any money they had to spend on entirely new works, and he believed that Mossley could erect these without increasing the price of gas. Mossley's present output of gas is roughly 220 million c.ft. per annum; and it is estimated that at the present rate of increase the output will reach 500 millions in the next five years. With such possibilities the present site is unsuitable. To-day transport charges alone amount to £2200 per annum—an expense which would be eliminated if new works were constructed contiguous to the railway.

Colwyn Bay Gas Department.—The accounts of the Colwyn Bay Urban Council for the year ended March 31, 1923, have just been issued. The Gas Department experienced an exceptionally good financial year, the net profit amounting to £9119. After paying all charges, £4055 is carried to the general fund. The make of gas exceeded by over 5 million c.ft. the production of 1922.

Rotherham Gas Undertaking.—The Rotherham County Borough Council, at their meeting last Wednesday, decided to reduce the price of gas by 4d. per 1000 c.ft., and they also authorized the Chairman and Engineer to negotiate for the purchase of an additional 500 automatic controllers, to be fixed to certain lamps. Alderman Bingham (the Chairman of the Gas Committee) pointed out that, with this fresh reduction, the price of gas would be 3s. per 1000 c.ft., to which level they had since 1921 brought it down from 4s. 9d.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following further notices regarding applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDER.

Borough of Brighouse.

Application is to be made to the Board of Trade by the Brighouse Corporation for an Order under section 10 to enable them to contract for the supply and purchase of gas in bulk, to regulate conditions for the supply of gas, to borrow and to re-borrow money, and to make provision for the application of gas revenue.

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Falkirk Corporation.

After the declared date, the word "therm" shall be substituted for "1000 c.ft." wherever mentioned in section 7 (reserve fund) of the Falkirk Corporation Gas Order, 1910, as confirmed by the Falkirk Corporation Gas Order Confirmation Act, 1910; "7·8d." shall be substituted for "3s. 3d.," and "8·4d" shall be substituted for "3s. 6d." wherever they occur respectively in that section; and "0·4d.," "0·3d.," and "0·2d." shall be substituted for "2d.," "1½d.," and "1d." respectively in that section. (March 31.)

Syston and Thurmaston Gas Light and Coke Company, Ltd.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15d. per therm, and this price shall be substituted for the price of 4s. 3d. per 1000 c.ft. wherever it is mentioned in section 25 (price of gas) of the Syston and Thurmaston Gas Order, 1902, as amended by the Order of the Board of Trade dated March 25, 1918.

After the declared date, the word "therm" shall be substituted for "1000 c.ft." in paragraph (ii.) of schedule B to the Syston and Thurmaston Gas Order, 1902, and "fifth of a penny" shall be substituted for "penny" wherever it occurs in that paragraph. (March 28.)

Stratford-upon-Avon Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm.

After the declared date, 2·8d. per therm shall be substituted for 1s. 2d. per 1000 c.ft. in paragraph (2) of Article IV. of the Stratford-upon-Avon Order, 1912. (April 1)

Special Orders Issued.

There have lately been issued by H.M. Stationery Office copies of the following Special Orders as made by the Board of Trade under section 10 of the Gas Regulation Act. They can be obtained at the cost of a few pence each at the Stationery Office, Imperial House, Kingsway, London, W.C. 2, or branches.

Accrington District Gas and Water Board; Brentford Gas Company; Hyde Gas Company; Nelson Corporation; Tynemouth Gas Company; Wolverhampton Gas Company; and York Town and Blackwater Gas Company.

NEWARK AUTHORITY'S GAS ACQUISITION.

In accordance with a recommendation which had been made at their previous meeting, the Newark Council determined, last Monday week, by 13 votes to 4, to purchase the undertaking of the Newark Gas Company, upon terms which have been already published [*ante*, p. 54], the arrangement being confirmed upon the proposal of Alderman Priestley (the Chairman of the Gas Committee), seconded by Mr. C. Stephenson.

Mr. A. Lacy referred to the prospects of gas for lighting and power being superseded by electricity. It had been said that corporations could conduct things better than a company. It was true they could borrow money on more favourable terms, but when a company made no profits there was no dividend, whereas if the corporation failed to make a profit they still had to pay interest and also to contribute to a sinking fund.

Mr. J. E. Palmer proposed, as an amendment, that if no better terms could be obtained the matter should fall through. There had been no capital expenditure in connection with the undertaking during the past year, and he was doubtful about the condition of the mains after many of them had been in existence for forty or fifty years. He did not think the works could be carried on as economically under the Corporation as by a private Company. Mr. G. Dobney seconded the amendment.

Alderman H. E. Branston urged that the purchase would be for the benefit of the ratepayers, who ought to own such an essential service as was represented by gas supply. He regarded the offer by the Company as being a fair one.

Replying to a question, Alderman Priestley explained that the officials now employed by the Company would be taken over as servants of the Corporation, and shareholders would be assured of the same income.

The purchase which has been decided upon involves an expenditure of £118,388. Mr. W. Doig Gibb has acted as the Company's adviser in the matter.

THE STOCKTON GAS UNDERTAKING AND RELIEF OF RATES.

The Mayor of Stockton (Councillor T. Wilkinson), in submitting the rate estimates last week, said the total amount borrowed in connection with the gas-works was £312,382, and the net debit was £107,148. The price of gas had been reduced during the year from 3s. to 2s. 9$\frac{9}{10}$d. net per 1000 c.ft. in the borough, and the outlying districts had also received substantial benefit. At the same time, a gas of greater calorific value had been supplied. There had been an increase of over 15 p.ct. in consumption. February's make of gas showed an increase of 18·20 p.ct. It was decided that £2000 from profits should go in relief of the rates.

Councillor C. W. Allison, in moving that this last item should not be sanctioned, said the gas undertaking had never been subsidized from the rates, as in the case of the electricity department. The capital value of the gas-works was nearly £250,000, and the reserve fund was only £5600, from which they proposed to take £2000. Would any private undertaking carry on on such lines? If the price of coal went up by 2s. a ton, as it probably would, the price of gas would have to be immediately increased. Up to 1902, the gas-works had contributed £122,748 to the relief of rates, and since 1902 £81,175. Where had the money come from? Even when the gas-works were bought, the money did not come from the ratepayers, but from the gas consumers. The poorest people in the town had been asked in the main to contribute this huge sum for the relief of rates. Despite the amounts taken, there remained a debt of £107,000 on the undertaking, the interest on which alone was equivalent to a 6¼d. rate. He contended that, by inserting a maximum price of 6s. instead of 5s. in their new Order, the Corporation would ensure that the rates would never be called on to finance the undertaking. If the £2000 were taken, it would mean an infinitesimal addition to the rates; but if given immediately towards a reduction in the price of gas, it would mean 1d. per 1000 c.ft.

Alderman J. M'Naughton (Chairman of the Gas Committee), in reply, said that a year ago the Committee estimated that they would spend just under £5000 in cookers and stoves. They actually spent £12,000; and it was felt that this was too much to be taken out of revenue to be placed towards what was undoubtedly a reserve fund. He contended it was only right that a fair percentage should be paid on the capital which the Stockton ratepayers had put up. Two years ago £80,000 was raised for gas-works improvements on the security of the rates.

The amendment was defeated by 20 votes to 12.

GLOVER AND MAIN, LTD.

The Annual General Meeting of shareholders was held at No. 38, Grosvenor Gardens, London, S.W., on April 7.

The CHAIRMAN (the Rt. Hon. T. McKinnon Wood), in moving the adoption of the Directors' report and accounts for the year ended Dec. 31, 1923, said: Since we met last year we have suffered a great loss by the death of Mr. A. P. Main, who had been a Director of the Company since 1897, and for ten years had been Vice-Chairman of the Board. He was well known in the gas industry, and the general respect in which he was held was evidenced by the fact that a few years ago he was elected Chairman of the Council of the Society of British Gas Industries. In 1921 he rendered an important service to the Company, and visited Australia, Canada, and other places on our behalf. Mr. Main took a practical and keen interest in social and philanthropic work and in public affairs. When he died he was a member of the Marylebone Borough Council. My own relations with him were always of the most friendly and cordial description. I am sure the same will be the case with the new Vice-Chairman who has been elected by the Board—my friend Sir Paul Makins. Mr. Main was a very friendly man; he had a generous appreciation of the good qualities of his friends—of whom he had a large number—and his friends in turn had a great respect for his high character, and warm appreciation of his many lovable qualities.

The Company have had a good year. The very satisfactory demand for our "Maintenance" and "Mainstay" cookers, which we reported last year, has greatly increased this year, and I am glad to say that since stock-taking this increase has not diminished. We have begun the new year well. Last year we had a record output. Our latest pattern gas-fire—the "Cinderella"—has been a great success since it was brought out last year. Its likeness to a coal fire, and its high efficiency, attract attention wherever it is installed. Gas undertakings who have placed it on their district find it has a ready sale and appeals to a wider circle of consumers than any other fire of this type. On the meter side the demand has improved during the last few months. We are bringing out a new meter, called the "Multi-Meter," which has been well received. The large increase of output has necessitated an enlargement of our foundry and other parts of the factory at Falkirk, and has also necessitated extensions at Edmonton, without which we could not have dealt with the volume of business which has been secured. With the object of developing still further the technical side of our business, the Technical Departments at Edmonton and Falkirk have been extended. The staffs of our highly-equipped laboratories are continuously engaged in improving the efficiency of our products, and in dealing scientifically with all points raised by our customers. We have recently secured the services of Mr. Forshaw, whose name will be known to many of you as one of the leading chemists in the industry. He comes to us in a few weeks' time.

Although labour charges have remained fairly constant, the prices of the principal raw materials used in our manufactures were higher in 1923 than in 1922. Last year was not entirely free from labour troubles. Our works both at Falkirk and Manchester were affected for short periods. Our system of road transport has been steadily developed. Motor lorries operate from our various manufacturing and distributing centres, and we are enabled to give prompt delivery. During the railway strike, deliveries to our customers were effected without any delay. Running costs show a steady decrease.

Our financial position is thoroughly satisfactory, and we have pleasure in declaring the regular dividend on the preference shares, and on the ordinary shares a dividend of 7 p.ct., making a total dividend of 10 p.ct. for the year. I beg to move that the report of the Directors and the accounts for the year ended Dec. 31, 1923, be adopted.

The VICE-CHAIRMAN (Sir Paul A. Makins) seconded the resolution, which was put to the meeting and carried.

The Rt. Hon. T. McKinnon Wood and Sir Paul A. Makins, Bart., were re-elected Directors of the Company.

Mr. Maurice L. Wells (Chartered Accountant) was re-elected Auditor of the Company.

On the motion of Mr. DANIEL IRVING, seconded by Mr. W. C. WIGLEY, a vote of thanks was accorded to the Directors and the staff, and responded to by the CHAIRMAN and the SECRETARY.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting was held at the offices of the Company, Flanders Street, Melbourne, on Jan. 26—Sir JOHN GRICE (Chairman of Directors) presiding.

The CHAIRMAN said that the profits for the half-year under review amounted to £95,339, from which sum transfers of £25,000 had been made to the reserve fund, and £5000 to the meter-renewal fund, leaving, after payment of the dividend, a balance of £339 to be added to the carry-forward, bringing this amount to £71,440. The cost of coal for the half-year ended Dec. 31, 1923, amounted to £360,048, as compared with £290,378 for the December half of 1922—an increase of £69,670. The revenue from the sales of gas—£662,324—showed an increase of £54,509 in comparison with the corresponding period of 1922. They would recollect that up to July last the selling price of gas was at the rate of 6s. per 1000 c.ft.; but, owing to the heavy additional expenditure incurred in carrying on operations, it became necessary to increase the price by 2s. 6d. on and after Aug. 12 last. Shortly after this decision, it had been decided to spread over a longer period the extra expenditure which had been directly incurred by the Company through the Maitland coal-miners' strike, and to reduce the price from 8s. 6d. to 7s. 6d. per 1000 c.ft. on and after Sept. 12.

The coal position during the last six months had caused the Directors much anxiety. At the time of the strike of the Maitland miners in the early portion of 1923, the Company's stocks had fallen to approximately 48,000 tons, and from April 11 to Aug. 8, 1923, none was received from the source from which the Company usually drew its supplies. By purchasing coal from outside sources, at very high prices, the Company had been able, under great difficulties, to produce a reduced quantity of gas, but with disappointing results. Since the resumption of deliveries of Maitland coal, every possible endeavour had been made again to build-up stocks, and some measure of success had been attained. From residuals the receipts were £140,648—a decrease of £6759 in comparison with the corresponding period of 1922, due to increased wages and handling charges. The total quantity of gas sold during the half-year was 1819 million c.ft., as compared with 1947 million c.ft. during the corresponding half of 1922—the actual decrease being 6·6 p.ct. Taking all circumstances into consideration, the business done by the stove department during the twelve months might be regarded as satisfactory; the total number of stoves sold during that period representing a net increase of 7838, as compared with a net increase of 7585 during 1922. The number of gas-fires sold during the year—viz., 817—showed a decrease of 200 as compared with 1922, but bath-heaters showed an increase of 158 and wash coppers an increase of 140. The industrial showroom had been in operation for four months, and had been visited by approximately 150 manufacturers, to whom demonstrations in metal melting, rivet heating, high-speed steel treatment, &c., had been given, resulting in the sale of 285 industrial appliances, as compared with 242 during 1922. Evening demonstrations had also been held, and a publicity campaign had been actively pursued, with the object of firmly establishing this important branch of the department.

At the meeting held in January, 1921, authority had been given to issue debentures to the amount of £584 210. Debentures had been issued on Oct. 1, 1921, for £500,000, leaving a balance of £84,210 unissued. The Directors proposed to issue this balance, and to re-issue £50,000 of debentures which expired on April 1, 1922, making a total of £134,210. On April 1 of this year, £50,000 of 4½ p.ct. debentures issued in London would fall due, and on Oct. 1, £38,000 of 4 p.ct. The Directors proposed to negotiate for the renewal of both these.

Sir JOHN HIGGINS (Vice-Chairman) said that the Company had experienced another gas inquiry. The investigating tribunal was appointed by the Victorian Legislative Assembly on Oct. 2, 1923, as a Select Committee. Stripped of all minor details, the result of the long and costly investigation was: (1) That the Select Committee "recommend the purchase of the undertaking of the Metropolitan Gas Company, and that it should be run as a public utility by an authority representing the citizens of the Metropolitan area." Failing effect being given to the recommendation to purchase, the Committee suggest: (*a*) The appointment of Gas Referees; (*b*) Calorific value is recommended in substitution of the illuminating standard; (*c*) The Select Committee, as with the Gas Inquiry Board of 1912, recognize the absolute and imperative need of a new site for gas-works for the future supply of Melbourne and suburbs; (*d*) The Company are to have the right to raise further capital subject to the approval of the Gas Referees. Among the miscellaneous recommendations were: (*a*) Superannuation fund for employees, to come into operation within six months. (*b*) Establishment of a Board of Conciliation.

Mr. RAYNES DICKSON moved, and Mr. P. J. BARRETT seconded, that "a dividend of 6s. 6d. per share be declared out of the profits for the half-year."

The motion was carried unanimously.

THE PRIMITIVA GAS COMPANY.

A Buenos Aires Paper's Appreciation of the Position.

Under the heading of "A Turning Point in the Career of a Great Industry," an interesting account appeared a few weeks ago in the "Review of the River Plate," published in Buenos Aires, of the position and prospects of the Primitiva Gas Company. From this we have extracted the following paragraphs.

Let us consider first the nature and the value of the foundation upon which the Primitiva Gas Company has been established. The foundation consists in the gas-consuming potentiality of a city with a population of nearly two million inhabitants. Counting the population of Buenos Aires at the rate of a family or a household for every five persons, it may be reasoned that there ought to be approximately 400,000 private gas consumers in this city. As a matter of fact, there is nothing extravagant in this calculation that there ought to be as many gas consumers as there are families, for the simple reason that in the great majority of European cities there are far more consumers than there are families as reckoned by the number of gas accounts issued. This is explained by the scale on which gas is used in offices, workshops, factories, restaurants, and in industrial plants. The city of Milan is a fair sample, owing to a certain amount of similarity in climate and in the temperament and habits of the people. Milan has a population of roughly 600,000, and a recent count of the consumers numbered the latter at 180,000. Reckoning that a population of 600,000 may represent, as is actually supposed to be the case in the Italian city named, approximately 150,000 families, it will be seen that there are 30,000 more accounts than there are private families in the whole city.

Assuming that gas for lighting purposes, and more especially for household fuel, has not yet been excelled by any other medium offering its services to the same end, it may be calculated, therefore, that there is a tremendous scope for the expansion of the gas output in Buenos Aires. Alongside a rough estimate of 400,000 potential gas consumers we have the bald fact that the actual number of consumers amounts, at this time, to less than 40,000. What may seem a misfortune when considered from one angle, may appear in the light of a golden gift of opportunity when contemplated from another. All that it is necessary to decide is whether or not gas is capable of meeting a common want. If the answer is in the affirmative, the Primitiva Gas Company is in the unique position of having before it such a tremendous scope that the multiplication of its volume of business by ten in the next quarter-of-a-century is not by any means beyond the bounds of possibility. In order to be able to see for this Company a wonderfully brilliant future, contrasting strangely with its past portion of adversity, it suffices to prove that gas is really a desirable and economical form of fuel which will be able to hold its own against future developments in the way of fuel and fuel transmission. We do not think there is any doubt upon the point we have just raised.

So much for the foundation upon which the Primitiva Gas Company stands. All that is necessary so as to realize upon the opportunity is to put the structure in order. The outbreak of war, the subsequent phenomenal increase in the cost of coal, the ultimate impossibility of getting sufficient supplies at any price, a long and trying period of thankless experimenting with other and freakish classes of fuel in an attempt to make gas, a long, drawn-out controversy with the Municipality over the gas account, of which a large sum had eventually to be written off—these are a few of the gusts which have spent themselves upon the enterprise during the past decade, while one of the most trying heritages of all has been the public prejudice against gas which was aroused during the period when coal was scarce or unobtainable, and when gas of low calorific value was being supplied by virtue of *force majeure*.

This prejudice is, slowly but surely, dying out, however, and during the past three years gas consumption has been increasing steadily. The quantity sold in 1923 was nearly 27 million cubic metres, compared with a little over 23 millions consumed in the previous year. January and February consumption was greater in 1923 than in 1922, and is greater in 1924 than in 1923. This is the trend of the gas business to-day; and the tariffs which are made up every quarter, and are based on the cost of coal and oil used, along with the quality of the gas, show that as consumption increases the tendency of cost to the consumer is decidedly downward. Even so, however, the Company has been fighting against unfair odds for some time past. Most of the existing plant is lacking in the economy and efficiency of modern designs embodying the very latest improvements and developments which are being used by the gas companies in Great Britain. It is here, however, that we come to the main item of proof that there is still a lot of push and vitality left in this severely battered undertaking, as the entire plant is to be replaced, and so far brought up to the very minute in every respect that in less than two years from now the Company will be in a position to manufacture gas on terms of the same relative economy and efficiency as the most modern and progressive gas-works in the world. This, in other words, is the turning point in the career of a great Company, which, after having fallen upon evil days, is about to rise up and advance to a state of prosperity such as only rewards the tenacious pursuit of a great opportunity.

West's Gas Improvement Company, Ltd., of Manchester, have received an order from the Primitiva Gas Company for a large installation of their patent vertical retort system, to produce 3½ million c.ft. per diem. This is part of a scheme by which the Company will proceed to modernize its methods of gas manufacture, and which will lead to the ultimate concentration of its various existing works in one big plant of larger capacity, but occupying considerably less space than the present scattered manufacturing units. The prime object of this decision is to manufacture gas of greater purity and more uniform quality, as well as to improve the residual products. In addition, the existing works are very costly to operate, and the processes in vogue, while by no means obsolete, are those of twenty years ago, when labour and material were very much cheaper. In connection with the new plant there will be an installation of waste-heat boilers.

THE AUSTRALIAN GAS LIGHT COMPANY.

The Half-Yearly Meeting of the Company was held on Feb. 7—Mr. George J. Cohen (Chairman) presiding.

The Secretary (Mr. C. V. B. Gurnett, F.C.I.S.) submitted the half-yearly report and presented the accounts.

The Chairman, in moving the adoption of the report, stated that the past half-year had witnessed one of the most important advances in the history of the supply of gas in New South Wales, in that gas could now be sold on the thermal basis. The total quantity of gas sold during the past six months amounted to 3,104,319,000 c.ft., compared with 2,818,499,000 c.ft. for the corresponding period of 1922, an increase of 10·1 p.ct. The gas consumers now numbered 183,946, showing a net increase of 5611. During the period under review 58 miles of mains and service had been laid, bringing the total to 3886 miles. The quantity of coal and oil carbonized during the half-year amounted to 273,137 tons, as compared with 258,047 tons—an increase of 15,090 tons. The cost of these commodities amounted to £303,955—a decrease of £22,712. The total revenue from the sale of gas was £823,556, as compared with £780,698 for the half-year ended Dec. 31, 1922. The extension to the works plant, rendered necessary by the ever-increasing demand for gas, had proceeded satisfactorily. Portions thereof would shortly be completed, and would be commissioned during the current half-year. The net revenue received from bye-products amounted to £79,058—an increase of £5878 over the corresponding half-year. The increase was made up from sales of tar and tar products, while slight decreases were recorded for coke and sulphate of ammonia. The coke position had been affected by the coal strike; inferior coke—representing a small proportion of the total output—bringing a correspondingly small revenue return. In regard to sulphate of ammonia, sales by New South Wales producers had been curtailed, owing to the drought conditions which prevailed in Queensland. The position was, however, being held. The propaganda movement with which their Company were associated continued to do good work, and the total sales throughout the Commonwealth showed an increase.

The work of the showroom had been particularly successful, and the number of gas-appliances sold during the past half-year constituted a record. During this period gas-cooker sales had increased by 1035, bath heaters by 252, and gas-coppers by 64, as compared with the corresponding period of 1922. This satisfactory condition was due to the policy of the management in giving consumers concessions in the matter of fitting gas-appliances, and in generally looking closer into consumers' requirements. The service so rendered could not be expressed in terms of money. Showrooms were more than mere selling units in the gas industry. They were a practical means of rendering efficient service to the community. Good public relations were the foundation upon which the ultimate success of the industry rested. The cookery instruction given by the Domestic Science Department of the Company had been greatly appreciated by housewives generally. During the past half-year the sale of gas for industrial purposes had also shown excellent progress.

At their last meeting reference had been made to the fact that conferences between representatives of the Gas Employees' Union and their Company had been held in an endeavour to arrive at an amicable agreement as to wages and working conditions. He had pleasure in reporting that once again the principle of conciliation had proved effective in settling any differences which might have existed between their employees and themselves. A new agreement had been entered into which would cover the next three years; and there was every prospect of a continuance of that peace in their industry which was of incalculable value to the community. They would notice that the capital of the Company had been further increased by the issue of 40,000 new "A" shares. These had been submitted to auction in terms of the Gas Act on October 8 last, and had been disposed of at prices ranging from £6 14s. to £6 12s.

The Company's Consulting Engineer, Mr. P. C. Holmes Hunt, M.Inst.C.E., had just returned from a visit to Great Britain and America, where inquiries of interest to their Company had been conducted. The Directors were looking forward with interest to obtaining from Mr. Hunt his views as to improvements and alterations which might be introduced as the result of his visit.

The Directors recommended the payment of a dividend for the half-year at the rate of 4 p.ct. on the old "A" and "B" shares, and in proportion on the new "A" shares.

The report and accounts were unanimously adopted.

Sligo Gas Undertaking.—The annual report of the Sligo Gas Company shows a net profit of £2095, which, with last year's balance, after providing for interest, &c., leaves £2486 at the credit of profit and loss account. A dividend of 5 p.ct. is recommended.

Interference with Gas-Pipes.—At Amlwch, Mr. Simmons, the Manager of the Amlwch Gas Company, summoned Captain Roberts, of Bryn Eira, Amlwch, and his four sons, with an offence under the Gas-Works Clauses Act. Mr. F. W. Pozzi, who prosecuted, stated that the defendants laid or caused to be laid a pipe whereby they had extracted gas. The gas was being used on the premises, though the meter had been taken away two years ago. Robert, Hugh, and James Roberts were each fined £3.

Dorking Gas Company.—The half-yearly meeting of the Company was held on March 27—Major H. Harman Young (Chairman) presiding. The report of the Directors showed that, after providing for interest on debenture stock and carrying forward a balance of £500 to the reserve fund, the amount available for dividend was £2956; and the Directors recommended the payment of dividends at the rate of 8 p.ct. per annum on the "A" and "B" shares, 7 p.ct. on the "C" shares, and 5 p.ct. on the "D" shares. This would absorb £1625, and leave £1331 to be carried forward to the next account. The Chairman, in moving the adoption of the report and accounts, said that the sales of gas had increased by 10½ p.ct. during the year. This was due, no doubt, to the reductions in the price of gas; a further reduction of ½d. per therm having been made at the beginning of the December quarter.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Market interest still centres round the prompt position. With the wages question at present unsolved, and uncertainty as to what the outcome will be, contractors are pressing for full deliveries. Tonnage is in plentiful supply, so that there is little free coal available for sale. Naturally there has been keen demand for any supplies on offer, and the Continent has been trying to buy more than of late. In reality little new business has been passing, collieries having to reckon with reduced outputs in view of the approaching Easter holidays.

All classes of coal have been quoted strongly, coking advancing to as much as 25s. for good sorts for prompt. Best gas qualities hold firmly to 25s. 6d. for this month, but would probably in some cases take 25s. for May. Seconds are about 24s.

Both Durham and Northumberland having been recommended by their executives to vote for acceptance of the terms—with, of course, the proviso of a Government inquiry—local opinion is inclined to optimism. In any case it is felt that a stoppage is unlikely this month. The outlook beyond strike possibilities is not bringing in much new trade, and it is obvious that present values are too high for forward sales. Ruhr production is increasing, and Continental demand cannot be maintained at last year's high level unless something unforeseen occurs. The market is steady for May; but 24s.—against to-day's 25s. 6d.—is more like the value for June onwards.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is a continued increase in the demand for all grades of coal in Yorkshire, and although in the neighbouring county of Lancashire the demand is perhaps not quite so insistent as it was a week ago, the collieries have as much as they can do to keep customers satisfied. Prices in both counties vary in accordance with the commitments of the collieries; and although some pits are inclined to advance extensively, others are keeping to normal figures. In the event of a settlement of the wages dispute the demand will be appreciably reduced.

Gas coals have appreciated for stocking purposes, and several concerns are reported to have paid increased prices for prompt deliveries. With the lengthening days there does not appear to be any anxiety about carrying on the industry, whatever may happen on the 17th.

Shipment inquiries are at the moment on the quiet side; and probably during the summer, with prices at a lower basis, they may take from the local market the surplus available.

The nominal prices at Hull at the week-end were: Bunkers—Yorkshire, Derbys, and Notts large screened steam, f.o.b. Humber ports, 29s. to 30s. Cargo for export, f.o.b. usual shipping ports: Best Yorkshire hards, Association, 34s.; Derby best hards, 32s. 6d.; West Yorkshire Hartleys, 30s. to 32s. 6d.; South Yorks. washed doubles, 30s.; South Yorks. washed smalls, 23s.; Derby slack, 1 inch, 18s.; South Yorks. rough slack, 19s. 6d.; gas coke, 41s. 6d.; foundry furnace coke, 30s.; washed smithy peas, 29s. 6d. to 33s.; washed steam thirds, 29s. per ton.

Lancashire prices are still well above the official figures, being from 38s. to 39s. at the pits for best house coal; 25s. to 26s. for unscreened industrial coal, and 18s. to 20s. for slacks.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Owing to the abnormal conditions many of the gas-works are being called upon for a peak output. This arises partly from the persistence of wintry weather and partly from the increased use of gas for cooking and heating on account of the difficulty experienced in getting coal and coke.

The effect is to accentuate the straits in which gas engineers find themselves. Try as they may, they cannot do anything effective to strengthen depleted reserves. A few gas undertakings that are specially well off for wagons may be able to keep pace with the consumption. As regards the majority, their position is becoming more precarious. Premiums of 4s. to 5s. are offered for special consignments. It is not so much a question of price as of supply, however. Collieries are doing their best to fulfil their contracts, which, in spite of everything, are falling into heavier arrear in some cases, and only those that habitually reserve a margin for sale on the open market will hearken to overtures for emergency lots.

Domestic and industrial fuels are being called for in quantities greatly exceeding the output. The rate of production in this district is still seriously affected by influenza and other sicknesses among the miners. Extravagant prices are bid for prompt supplies; but the coal is not available. Transport appears to be working rather better.

Gas coke is unobtainable. Blast-furnace coke is still short—about 26s. 6d. at ovens being quoted.

Londonderry Gaslight Company.—Mr. R. H. Smyth presided, at the annual meeting of the Company, held on March 28. In moving the adoption of the report and accounts, he drew attention to the reconstruction work carried out during the year. At present all the gas being made was produced by the new setting. They were expecting great results from the new plant, and anticipated a considerable saving in the cost of production, which would in the course of time react on the price charged for gas. The consumption of gas showed an increase during the year. People were using gas for cooking and heating more than ever they had done previously. Dr. Henderson proposed, and Mr. Thompson seconded, a vote of thanks to the Chairman, Directors, and officials. The Chairman replied on behalf of the Directors, and Mr. R. J. Skinner (Engineer, Manager, and Secretary) on behalf of the officials.

TRADE NOTES.

The Underfeed Stoker Company, Ltd.

We have pleasure in hearing of the large number of orders for travelling-grate stokers, pulverized-fuel plants, underfeed stokers, air heaters, ash conveyors, &c., which the firm have recently obtained. Many of these are from corporations, among which may be mentioned Norwich, Carlisle, Maidstone, Walsall, and Hull. Several overseas orders have also been received.

Meldrum Specialities.

A long list of orders received for their different specialities by Messrs. Meldrums, Ltd., of Timperley, near Manchester, since the commencement of the present year includes a gas-washing plant for the March Gas Company. Among the 43 boilers of various types which have been fitted with their forced-draught furnaces and mechanical stokers are mentioned gas-works, coke-ovens, and tar distilleries.

Lubrication.

A bright and intriguing little booklet has been issued by the Henry Wells Oil Company, descriptive of the "Germ Process" Motoils. The whole question of lubrication, they say, is one of surface tension; the lower the tension the more the oil "clings" to the solid surfaces, and the better it is as a lubricant. The "Germ" is a substance which lowers the surface tension of oils, and hence increases their lubricating value. Those interested should communicate with the firm at No. 11, Haymarket, S.W. 1.

New Coal-Handling Plant for Elland.

Messrs. Robert Dempster & Sons, Ltd., of Elland, are to instal an electrically driven coal-handling plant at the works of the Elland-cum-Greetland Gas Company. It will discharge coal from canal barges at the rate of 15 to 20 tons per hour. The new plant is one of the various additions and improvements which have characterized the Elland Gas Company in recent years. The manual coal-handling equipment has been in use over thirty years, having been installed in 1893, and was an innovation at that time.

Lincoln Gas Profits.

Faced by the necessity of largely increasing the municipal rates, due mainly to expenditure on unemployment relief, necessitated by long-continued depression in the city's chief industry, the Lincoln Council decided at their last meeting to allocate £7500 from the profits of the gas undertakings, in relief of abnormal financial burdens during the ensuing year. It was not, however, without a strong protest that this determination was arrived at; the feeling being that gas consumers, in addition to bearing their ordinary share of municipal burdens, are thus being saddled with an extra incubus. As it is the rates for municipal and poor law purposes will total 16s. 8d. in the £ in the next twelve months, or an increase of 1s. 6d. upon last year. How much more serious the position would have become but for the ability to draw further upon the gas funds is indicated by the fact that, but for the grant of £7500, an additional call upon the ratepayers for another 6d. in the pound would have been necessitated. The extent to which the Lincoln municipality has been indebted to gas profits, in alleviation of local rates, is shown by the fact that altogether no less than £60,000 has been annexed from the funds of the undertaking during the period of its corporate ownership. Although an elaboration of the process appears open to criticism upon the score of its inequitable bearing upon those who contribute to the gas revenue, the defence is forthcoming that the municipal exchequer has never been subjected to more severe strains than during the post-war period; the decadence of the city's chief enterprises, largely owing to the closing of Russian markets and other former remunerative territories for Lincoln's main mechanical products having led to the expenditure of no less than £300,000 upon unemployment relief. While feeling constrained, in the circumstances, not to vote against the proposal, the Chairman of the Gas Committee pertinently expressed the view that it was rather hard to annex in two years about £14,000 from the profits of the undertaking; but, confronted by an otherwise insurmountable difficulty, the Corporation had no alternative but to acquiesce in the Finance Committee's recommendation.

Annual Dinner of Messrs. A. G. Sutherland, Ltd.—The staff and employees of the firm held their annual dinner and smoking concert on Saturday, March 29—Mr. B. E. Mace, Managing Director, presiding. A most enjoyable evening was spent; and after the loyal toast had been given, an excellent concert was provided. The toast of the firm was proposed by Mr. Elkington. In replying, the Chairman alluded to the great progress which had been made by the Company, and attributed their success in a large measure to the splendid co-operation existing between the Company and their employees. Mr. Avery proposed the toast of the staff, which was suitably responded to by Mr. Lewis. A happy evening terminated with the singing of the National Anthem.

A Tribute at Smethwick.—In connection with the ceremony of cutting the first sod for the erection of a new gasholder at Smethwick, Councillor Stephen (who was complimented upon the workmanlike way in which he handled the spade) said they hoped that enterprise would result in enhanced success of the gas undertaking. They also trusted it would amply prove that they possessed a highly qualified Engineer in Mr. E. Hardiker, and that it would set the seal on his fame in the gas industry. The Committee had reposed every confidence in him, and he in turn had given them of his very best. While that was fully appreciated, they trusted that they would retain his services for many years to come. The progress of the undertaking since Mr. Hardiker was appointed had been very steady, and the developments had undoubtedly resulted in great benefit to the gas consumers. While they were entering into serious financial obligations, yet they realized the time had arrived when they should make the necessary provision for the future requirements of the borough.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

April 7.

The market for pitch has been quiet throughout the past week, and offers which have been made both in London and on the East Coast at 55s. have been declined by buyers. Creosote oil is quiet, and just at present there appears to be a cessation of inquiry for export, and the value does not exceed 8½d. f.o.b. or 7½d. to 7⅝d. *ex* works. Carbolic acid is firm, and compared with the price of crystals is selling at a good figure. Cresylic acid is quiet, and there is not much demand. Naphthalene is dull. Pure is reported to have been sold at £15.

The average values for gas-works products during last week were: Gas-works coal tar, 47s. to 52s. Pitch, East Coast, 52s. 6d. to 55s. f.o.b. West Coast—Manchester, 49s. to 50s.; Liverpool, 50s. to 51s.; Clyde, 51s. 6d. to 52s. 6d. Benzole 90 p.c.t., North, 1s. 5d. to 1s. 6d.; crude 65 p.c.t. at 120° C., 1s. to 1s. 1d. naked at makers' works; 50-90 p.c.t., naked, North, 1s. 8d. to 1s. 10d. Toluole, naked, North, 1s. 5d. to 1s. 6d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7½d. to 7⅝d.; Scotland, 7d. to 7¼d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.c., 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.c., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

Our correspondent for tar prices from the Manchester district writes: The average price realized for the sale of tar, according to the sliding-scale, for the month of February, was £3 7s. 1·1d.

Light Falls at Operation.—At the critical moment of an operation, the failure of the electric light led to the death of Miss Dewland at the West Middlesex Hospital last week. Dr. Cook, who performed the operation, said that it would have been successful but for the light failure.

Improvements at Uttoxeter.—It is understood that the Uttoxeter Gas-Works, Ltd., who are applying for powers to increase the capital of the Company, are contemplating considerable alterations and additions at the works which are now urgently required to meet the growing consumption of gas. A three-lift telescopic gasholder, of a capacity of 250,000 c.ft., is to be erected, and there are to be additions to the carbonizing plant, and other improvements, together with larger mains from the works. When these extensions are carried out, the Company will be able to cope with any increase of business for some years to come.

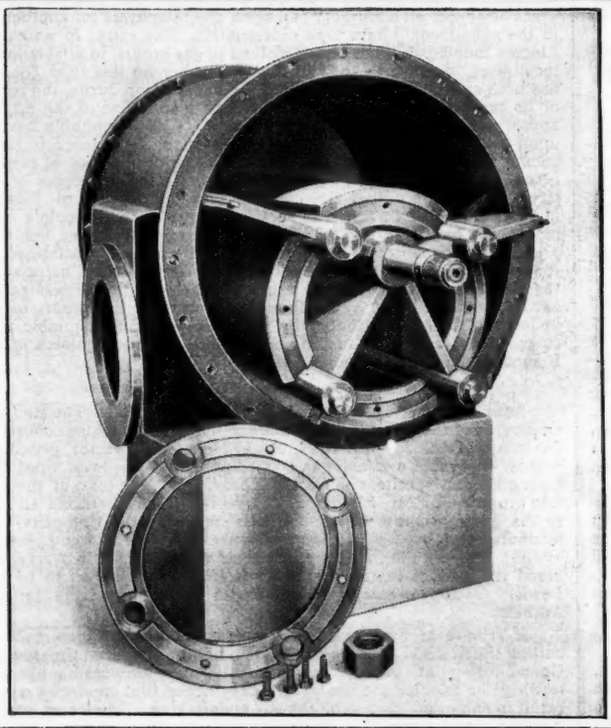
Knutsford Light and Water Company.—The accounts of the Company show that for the half-year ended Dec. 31, after paying all expenses, including Directors' fees and income-tax, the net profit from gas was £1500.

New Companies.—Sulphate of Ammonia Export Traders, Ltd., is the title of a Company (limited by guarantee) registered to act as agents for the sale of sulphate of ammonia. The offices are at No. 16, Mark Lane, E.C. Leigh Smokeless Fuels, Ltd., will carry on business as manufacturers of smokeless fuel; the capital being £125,000 in £1 shares.

Brixham Gas Company.—Mr. W. A. Scott presided at the annual meeting of the Brixham Gas Company. The Directors' report showed a profit of £2561 on the gas account and £389 on the electricity account. After payment of interest, interim dividends, &c., and carrying forward £334 to the renewal fund, there remained a balance of £2210, out of which the Directors have paid the preference dividend to Dec. 31 last. They recommended the payment of the standard dividend for the half-year at the rate of £11 5s. p.c.t. per annum on the original ordinary shares, and £7 17s. 6d. per annum on the additional ordinary shares.

Corbridge Gas Company.—The annual meeting of the Company was held under the presidency of Mr. C. Renwick. In moving the adoption of the accounts for the year ended Dec. 31, which showed a gross profit of £859, the Chairman stated that the year's working had been very satisfactory. The sale of gas had increased 8·6 p.ct., and the Directors had decided to reduce the price by ⅜d. per therm from the date of reading meters in the current quarter. He proposed that a dividend of 6 p.ct. (less tax) be paid; that £163 be transferred to the reserve fund; and that the balance be carried to the next account. This was agreed.

Glasgow Gas Supply Area.—Suggestions having been received by the Glasgow Corporation Gas Sub-Committee on behalf of the Renfrew Town Council and the Coatbridge Gas Company that agreements should be entered into permitting of the supply of gas by these undertakings in two small areas within the Corporation limits of supply, the Sub-Committee, having considered a report of the General Manager (Mr. J. W. M'Lusky) to the effect that it is not expedient meantime for the Gas Department to supply gas in the said areas, having in view the heavy capital expenditure which would have to be met in laying the necessary mains, and the fact that there is no prospect of these areas being developed in the immediate future, agreed to recommend that, during the pleasure of the Corporation, and under reservation of the Corporation's right to take over the supply on terms, (*a*) the Burgh of Renfrew be granted permission to light-up the part of the new road in the burgh situated within the Corporation's area of supply; and (*b*) the Coatbridge Gas Company be granted permission to supply gas to the portion of Glenboig, in the parish of Cadder, and the village of Gartcosh, situated within the Corporation's area of supply.



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STOCK MARKET REPORT.

THE offer for the conversion of £200,000,000 5 p.ct. War Loan was the principal event of last week, and the success of the proposal is regarded as assured. Under the scheme holders who elect to convert will receive £103 of a new 4½ p.ct. Conversion Loan 1940-44. It will result in a reduction, allowing for repayment at the latest date, from a 5 p.ct. to a £4 14s. 8d. p.ct. investment, which reduction is hardly likely at the present time to appeal to the ordinary small investor. In due course there will be a saving of approximately £730,000 per annum to the Government, and the immediate effect has been a substantial improvement of British credit. There has been a brisk demand for all gilt-edged securities, and prices rose steadily throughout the week. The principal increases were Funding Loan 2½ and Conversion Loan 2$\frac{7}{16}$.

The improvement was reflected in Home Rails, which also benefited by the Tramway Strike settlement.

New issues continue in popularity. The important issue of preference shares in the Allied Newspapers was largely oversubscribed, and the lists closed on Monday. The proposed Queensland Loan for over £12,000,000 at 5½ p.ct. to be offered at 99½ p.ct. was underwritten at the end of the week.

The Industrial Market also showed signs of the more hopeful tone, in spite of continued labour problems; Courtaulds and Tobacco issues being most prominent.

The reports of the Provincial Exchanges show that the buoyancy of the markets is general. At Birmingham, Singers, Baldwins, and Guest-Keens improved. At Manchester, Cotton shares were firm. Business, however, was quiet on the Scottish Exchanges.

Gas stocks were steady. The improvement in the value of the French franc caused an upward movement in Continental issues, and there was a fair amount of business recorded. Changes in quotations were: Rises—European 1, to 7 8; Gas Light and Coke 3 p.ct. debenture 1, to 58-61; Imperial Continental 5, to 143 148; San Paulo 5 p.ct. debenture 1, to 38-41; South Metropolitan ordinary 1, to 96-98. Falls—British ordinary 1, to 117-122; San Paulo 6 p.ct. preference ½, to 5½ 6.

The following transactions were recorded during the week: On Monday, Bombay 5½, British 118 *ex* div., Commercial 3½ p.ct. 91½, Continental Union 28, 28½. Gas Light and Coke 90½, 90⅝, 90½, 90⅝, 90⅞, 91, 4 p.ct. preference 77⅜ 78¼, 3 p.ct. debenture 60, Imperial Continental 139½, 140, 140½, Montevideo 54, 56½, Primitiva 4 p.ct. debentures 71½, 4 p.ct. debenture (1911) 54⅜, South Metropolitan 96, 96½, 97, 3 p.ct. debenture 60, 6½ p.ct. debenture 105, South Suburban 5 p.ct. 97, Tottenham "B" 100½. Supplementary prices, Montevideo 5 p.ct. first mortgage debenture 74, 74½. On Tuesday, British 118 *ex* div., European 6, Gas Light and Coke 90, 90½, 90⅜, 91, 3½ p.ct. maximum 61, 4 p.ct. preference 77½, 78½, 78⅜, 78½, Imperial Continental 140, 140⅞, Montevideo 56, 56½, Primitiva 8s. 1½d., 5 p.ct. preference 33s. 3d., South Metropolitan 96, 96⅞, South Suburban 5 p.ct. 98, 98½. Supplementary prices, Liverpool 5 p.ct. 90, Northampton 7 p.ct. debenture 106½. On Wednesday, Bournemouth "B" 12, Brentford 4 p.ct. debenture 78, Cape Town 7$\frac{5}{16}$, Gas Light and Coke 90, 90½, 90½, 90⅝, 90¾, 3½ p.ct. maximum 61, 4 p.ct. preference 78½, Imperial Continental 140¾, Primitiva 8s. 3d., 5 p.ct. preference 33s. 6d., 4 p.ct. (River Plate) debenture 55½, 56½, South Metropolitan 96½, 96¾, 6½ p.ct. debenture 104, South Suburban 5 p.ct. 98⅜, Wandsworth 3 p.ct. debenture 57. Supplementary prices, Gas Light and Coke 10 p.ct. bonds 192, 193, Malta and Mediterranean first 7 p.ct. preference 95s. On Thursday, Bournemouth 4 p.ct. debenture 78, Brentford 5 p.ct. preference 91½, British 118, 119, European 7, Gas Light and Coke 90, 90⅜, 90½, 90⅝, Montevideo 55, 56½, Oriental 101½, Primitiva 8s., 5 p.ct. preference 33s. 3d., South Metropolitan 96½, 96⅞, 97, South Suburban 5 p.ct. 99. Supplementary prices, Southgate 5 p.ct. preference 85, Wandsworth 3½ p.ct. new 97½. On Friday, Bournemouth 5 p.ct. 12½, "B" 12½, 12⅝, 12⅞, 4 p.ct. debenture 79⅜, Bristol 5 p.ct. 90, Croydon sliding-scale 103½, European 7½, Gas Light and Coke 90, 90½, 3 p.ct. debenture 59½, Imperial Continental 145½, Primitiva 5 p.ct. preference 33s., 33s. 9d., 4 p.ct. debenture (1911) 54⅜, San Paulo 5 p.ct. debentures 40, 40½, South Metropolitan 97, 97½, 3 p.ct. debenture 59, Tottenham "B" 99, 4 p.ct. debenture 78. Supplementary prices, British 4 p.ct. debentures (Act 1896) 75⅝, 76, Liverpool 5 p.ct. 90, 90½, 90⅝.

A fair amount of business was reported in French francs, which continued to improve during the week. There was a slight reaction at the end of the week, and, after touching 71.10, closed on Friday at 74 97½. As is usual, Belgian francs moved in sympathy. The dollar-sterling was again steady and closed slightly higher at 4.30⅜.

At the close of the week there was an abundant supply of money, and the rate for fresh overnight accommodation, which earlier in the day had been charged at 2 p.ct., fell to 1 p.ct. There was an allotment of £500,000 Treasury Bonds which realized £94 13s. 8·4d. Treasury Bills were sold at an average rate of discount of £2 18s. 2·9d., which was slightly higher than a fortnight ago, but about 3s. less than last week. The lower rate affected discount quotations.

Silver was dull, and the price fell, on offers from China, to 32⅞d. per oz.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2½ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, April 4.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
151,978	Stk.	Feb. 7	—	5	Aldershot 5 p.c. max. C.	..	70—75	...
217,992	,,	,,	4	4	Do. 4 p.c. Pref. .	..	68—73	...
1,551,868	,,	Apl. 3	2½	6	Alliance & Dublin Ord.	59—64	68—71*	...
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	76—79	00—65	...
280,000	5	Oct. 18	7½	8	Bombay, Ltd. . . .	5⅜—6⅜	5—5⅜	5⅜
100,000	10	Mar. 6	—	8½	Bournemouth Gas and Water { B 7 p.c. .	..	12¾—13¼	12¾
					{ 6 p.c. Pref.	13½—14	11—12	12—12½
383,110	10	,,	7	7	{ 4 p.c. Deb.	..	75—80	78—79⅛
115,000	10	,,	6	6	Brentford A Consolid. .	..	96—101	...
162,025	—	Dec. 28	—	4	Do. B New . .	..	96—101	
992,045	Stk.	Feb. 21	—	6½	Do. 5 p.c. Pref. .	109—111	89—94	91½
734,920	,,	,,	—	6½	Do. 4 p.c. Deb. .	91—93	76—81	78
55,000	,,	,,	5	5	Brighton & Hove Orig. .	208—213	170—175	...
221,400	,,	Dec. 13	4	4	Do. A Ord. Stk.	134—139	124—127	...
214,740	,,	Mar. 6	11	11½	Bristol 5 p.c. max. . .	..	90—91⅛	90
244,200	,,	,,	8	8½	British Ord.	..	117—122	118—119
1,387,500	Stk.	Feb. 21	—	5	Do. 7 p.c. Pref. . .	..	120—125	...
853,000	,,	Mar. 20	—	7	Do. 4 p.c. Deb. Stk.	88—90	73—78	...
100,000	,,	—	—	7	Cape Town & Dis., Ltd.	1¼—2¼	6⅞—7⅛	7$\frac{5}{16}$
140,000	,,	Dec. 28	4	4	Do. 4½ p.c. Pref. .	4—6	6—7	...
100,000	10	,,	—	6	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
100,000	10	Oct. 31	—	4½	Cardiff 7½ p.c. Deb. . .	..	105—110	...
130,000	Stk.	Dec. 28	4½	4½	Chester 5 p.c. Ord. . .	108—110	85 -90	...
237,860	,,	,,	—	7½	Commercial 4 p.c. Stk.	106—108	90—95	...
137,150	,,	Mar. 6	5	6½	Do. 3½ p.c. do.	103—105	90—95	91½
1,513,280	,,	,,	5/9/4	6	Do. 3 p.c. Deb. Stk.	69½—71½	56—60	...
560,000	,,	,,	5½	6	Continental Union, Ltd.	76—79	28—33	28—28½
475,000	,,	Dec. 13	3	3	Do. 7 p.c. Pref.	115—118	75—80	
800,000	,,	14 Jan. 15	4	—	Croydon sliding scale. .	..	99—102	103½
800,000	,,	Dec. 13	7	7	Do. max. div. . .	..	83—86	...
660,000		Mar. 6	—	6½	Derby Con. Stk. . .	135—135	108—110c	...
284,975		,,	—	5	Do. Deb. Stk. .	102—104	74—76c	..
492,270	Stk.	Feb. 21	6	4½	East Hull 5 p.c. max. .	..	..*	..
55,000	,,	Jan. 12	4	4	European, Ltd. . . .	17½—18	7—8	6—7½
809,000	,,	Apl. 3	—	5	Gas { 4 p.c. Ord . . .	98—102	90—92	90—91
1,002,180	10	Jan. 24	10	2	Gas { 3½ p.c. max. . .	76—79	60—63	..
16,346,120	Stk.	Feb. 7	4/17/4	5½	Light { 4 p.c. Con. Pre.	96—99	77—80	77½—78½
2,600,000	,,	,,	3½	3½	and { 3 p.c. Con. Deb.	72½—74½	58—61	59½—61
4,062,235	,,	,,	4	4	Coke { 10 p.c. Bonds .	—	..	192—193
4,761,930	,,	Dec. 13	3	3	{ 7½ p.c. Ilford Deb	..	..	...
130,000	,,	Dec. 11	10	10	Hastings & St. L. 5 p.c.	..	91—96	...
42,000	—	—	—	7½	Do. 3½ p.c.	87—89	76—81	...
82,500	,,	Mar. 20	5	6½	Hongkong & China, Ltd.	16½—16¾	16—17	...
858,740	,,	,,	3½	5½	Hornsey 7 p.c. . . .	..	143—148	...
70,000	10	Oct. 18	11	10	Imperial Continental .	150—160	142—148	139½—145½
86,600	Stk.	Mar. 6	9	10	Do. 3½ p.c. Deb. Red.	84—86	69—72	...
1,376,000	,,	Nov. 15	9	5	Lea Bridge Ord. 5 p.c.	119—121	92—97	
401,400	,,	Feb. 7	3½	3½	Liverpool 5 p.c. Ord. .	—	89—90b	90—90⅜
235,242	,,	Mar. 6	6½	6½	,, 7 p.c. Pref. .	..	103½—106½b*	...
2,127,340	,,	Feb. 21	—	5½	Maidstone 5 p.c. . .	—	124—129	.
600,000	,,	Mar. 20	—	7	Do. 3 p.c. Deb . .	..	54—59	...
165,736	,,	Feb. 21	7/5/0	8	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4⅝	3⅜—3¼	...
63,480	,,	Dec. 28	—	3		99—101	93—96*	...
75,000	5	Dec. 13	6	5	Montevideo, Ltd. . .	..	54—59	54—5 ⅛
50,000	100	Apl. 1	4½	4½	Newcastle & Gatsh'dCon.	98½—99½	85—86d	85¼
541,920	Stk.	Nov. 29	4	4	Do. 4 p.c. Pref. Stk.	..	73—75d	...
1,575,892	,,	Mar. 6	4½	5½	Do. 3½ p.c. Deb.	82—83	71—73d	...
250,166	,,	,,	—	4	North Middlesex 10 p.c.	—	16—17	...
139,705	,,	Dec. 28	3½	3½	,, ,, 7 p.c.	14—15	11½—11¾	...
15,000	10	Mar. 6	—	11	Oriental, Ltd. . .	117—122	97—102	101½
75,940	10	,,	7/14/0	7$\frac{5}{16}$	Plym'th & Stonh'se 5 p.c.	—	107—112	...
500,000	Stk.	Nov. 29	8	9	Portsea Island, B .	128—131	102—105	...
138,120	Stk.	Dec. 28	—	7½	Do. C . .	118—121	98—103	...
60,000	50	Mar. 6	13	13	Primitiva Ord. . . .	5⅛—6	⅞—1	8/—8/3
100,000	50	,,	12	12	Do. 5 p.c. Pref. .	4⅝—5	1⅛—1⅜	33/—33/9
1,450,345	5	29 Oct. 14	8	—	Do. 4 p.c. Deb. .	91—93	70—75	7½
2,499,800	5	30 Dec. 15	5	—	Do. ,, ,, 1911	—	54—57	54⅜
341,400	100	Dec. 3	4	4	Do. B. Aires 4 p.c. Deb.	85—87	55—58	..
600,000	Stk	Jan. 24	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58	55⅛—56¼
220,335	,,	Dec. 28	4	4	San Paulo { 6 p.c. Pref.	10⅛—11	5⅛—6	
321,670	,,	,,	4	4	{ 5 p.c. Deb.	47—49	38—41	40—40½
150,000	10	Oct. 4	6	6	Sheffield A	..	99—101s*	...
125,000	50	Jan. 2	5	5	Do. B	..	99—101s*	...
270,000	Stk.	Mar. 20	—	5/8/4	Do. C	..	99—101s*	...
419,968	,,	,,	—	5/8/4	Shrewsbury 5 p.c. . .	—	..	...
1,047,000	,,	,,	—	5/8/4	South African . . .	10½—11½	7—9	...
133,401	Stk.	—	4	6	South Met. Ord. . . .	111—113	96—98	96—97½
90,000	10	Oct. 18	9	6	Do. Red. Pref. .	..	98—100	...
5,609,805	Stk.	Feb. 21	5/9/4	6½	Do. 5 p.c. Deb. .	72½—74½	57—60	59—60
102,580	,,	Jan. 10	—	5	Do. 6½ p.c. Deb.	..	103—105	104—105
1,895,445	,,	,,	3	3	South Shields Con. Stk.	157—159	136—138d	...
734,000	,,	Mar. 6	—	6½	S'th Suburb'n Ord. 5 p.c.	114—116	95—100	97—99
91,500	,,	Aug. 23	8½	8½	Do. 5 p.c. Deb. Stk.	116—118	95—100	...
1,087,795	,,	Feb. 21	6	6½	S'th'mpt'n Ord. 5p.c. max	99—102	86—89	...
368,837	,,	Dec. 28	5	5	Do. 4 p.c. Deb. Stk.	..	74—79	...
647,740	,,	Nov. 15	5	5	Swansea 7 p.c. Pref. Stk.	..	100—102	...
121,375	,,	Dec. 28	4	4	Do. 6½ p.c. Deb. Stk.	..	102—104	...
250,000	,,	Mar. 6	—	7	Tottenham { A 5 p.c. .	135—138	119—124	...
200,000	,,	Dec. 28	—	6½	{ B 3½ p.c. .	125—127	98—103	99—100½
120,000	,,	Feb. 21	—	8	District { 4 p.c. Deb	87—89	77—81	78
882,275	,,	,,	6	6½	Tynemouth Con. & New	102½—109	84—86d*	...
181,255	,,	Dec. 13	4	4	Wandsworth, Wimbledon, and Epsom—			
858,251	Stk.	Mar. 20	5	7/14/4	Wandsworth A 5 p.c. .	151—156	132—137	...
30,000	,,	Mar. 6	8½	9½	Do. B 3½ p.c. .	129—134	110—115	...
258,638	,,	,,	6½	7½	Do. C. . . .	110—115	96—101	...
108,875	,,	,,	5/17/3	6/7/9	New Ordinary . . .	..	..	97½
240,865	,,	,,	—	6/7/9	Wimbledon 5 p.c. . .	117—122	105—110	...
152,000	,,	,,	6½	7½	Epsom 5 p.c. . .	121—126	112—117	...
98,000	,,	,,	6½	7½	3 p.c. Deb. Stk. . .	66—69	56—61	57
88,416	,,	Dec. 28	5	5				

Quotations are—a.—Bristol. b.—Liverpool. g.—Nottingham. d.—Newcastle. s.—Sheffield. * Ex div.

Prepayment Meter Robbery.—The Matlock Magistrates last Wednesday sentenced a man named Robert Lane, of no fixed abode, to three months' hard labour, on a charge of robbing, at a lodging house, a gas-meter belonging to the Matlock Gas Company. An employee of the Company said he found the slot-meter had been broken open, and by the gas recorded as used there was a loss of £1 2s. 8d.

Tamworth Gas Company.—At the half-yearly meeting of the Company, the Chairman (Alderman G. Hoskison) proposed that dividends for the six months ended Dec. 31 be declared at the rates per annum of 7½ p.ct. on the old shares and 5¼ p.ct. on the new shares, less income-tax. Dr. A. E. Richardson, who seconded, mentioned that the finances of the Company were steadily improving, and it was hoped they would once more be able to pay the full dividend.

Farringdon Road Fire.—One of the most serious fires which have broken out in recent years in the inner area of London occurred shortly before seven o'clock on Monday night at Nos. 69 and 71, Farringdon Road. The premises involved were those occupied by Messrs. G. Hands & Co., gas fittings, &c., merchants. The fire originated on the second floor of the building and spread rapidly until the upper floors became alight, and the flames broke through the roof. The basement also took fire. The loss is estimated at £25,000. We are assured, however, that the firm are in a position to carry on business as usual.

Messrs. C. & W. Walker, Ltd.—At the annual meeting of the shareholders at Birmingham on Thursday last, Col. C. H. Wright (Deputy Chairman) made sympathetic reference to the loss the Company had sustained by the death of their Secretary (Mr. W. Cottrell). He said Mr. Cottrell had been at the works for over 49 years, and his last act before his sudden death was to prepare the balance-sheet. In moving the adoption of the report, Col. Wright mentioned that the Company, in conjunction with two other firms, had taken over the patent rights for the construction in this country and the Colonies of a tankless gasholder, which, in the opinion of the Directors, was the gasholder of the future.

New Inverted Incandescent Gas-Lamp Company.—The Directors of the Company announce that the items in the balance-sheet—patents £44,000, and goodwill of Sunlight and Safety Lamp Company £15,000, having, as to the former, long since lapsed, and, as to the latter, ceased to have any separate value, they propose that they should be entirely eliminated from the accounts, and that the shares be written down to something nearer to their intrinsic value. It is therefore proposed to cut down the shares by one-half, by cancelling 10s. a share, and to increase the capital by the creation of 108,251 shares of 10s. each. The capital will thus be £125,000, divided into 250,000 shares of 10s. each, of which 108,251 are issued and the remaining 141,749 unissued. An extraordinary meeting will be held at No. 50, Gresham Street, E.C., to-morrow (April 10).

A fire occurred at the Royal Hygienic Bakery, Brampton, near Chesterfield, on Friday, due to a faulty gas pipe. Little damage was done.

The Ambergate and Bull Bridge Gas Company have extended their mains to the Heage district, where many new consumers have been secured.

During the last ten years, the Blackpool rates have been relieved from gas profits to the extent of £41,000, but in the ten years previously the total amount handed over reached £122,000.

At a meeting of the Buxton Town Council on Friday, the Gas Engineer (Mr. Shaw) reported on the present coal stocks; and it was decided to accept the tender of Messrs. E. Foster & Co. to supply 3000 tons of Hoyland screened gas coal.

The Colne Town Council have decided to apply to the Minister of Health for sanction to borrow £7000 for the extension of the gas-mains, £3000 for meters, £7000 in respect of new purifying plant, and £10,000 to provide working capital for the department.

A petition signed by 1020 persons protesting against the price of gas in the town was read at a recent meeting of the Newton Abbot Urban Council. Mr. Heywood said there was a notification that the price would be reduced by 4d. from Lady-Day. It was decided to ask representatives of the Gas Company to confer with the Council.

Members of the Lytham-St. Annes Council paid a visit of inspection to the new gas-works at Eastham on March 26, and were favourably impressed with the progress made. An interesting ceremony was the christening of a small shunting engine by Councillor J. Rossal, J.P., to which the name of "Critchley" was given. Subsequently the Mayor (Alderman C. F. Critchley) drove the engine along the siding track.

Mr. J. H. Ellis, the Chairman of the Plymouth and Stonehouse Gas Company, stated recently that his Company had anticipated the possibility of a strike on the part of the coal miners, and had so guarded against the consequences of it that they had no fear whatever for their consumers. He said that should a strike take place the Plymouth Gas Company would be able to continue an uninterrupted supply even were it prolonged for three months. They had coal, oil, and coke.

At a Bradford City Council meeting, when the budget statement was made, announcing a welcome reduction of 1s. 5d. in the pound in the rates (the new rate being 14s. 7d.), Mr. George Walker (Chairman of the Gas Committee) made reference to the taking of gas profits for the relief of the rates, which was one of the factors which had enabled the reduction to be made. He concluded: "I feel that after this year I shall go in for making a plunge in reducing the price of gas, so there will not be much left at the year-end for the local Chancellor of the Exchequer to take."

THE

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for 1924

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